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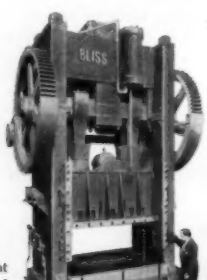

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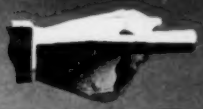

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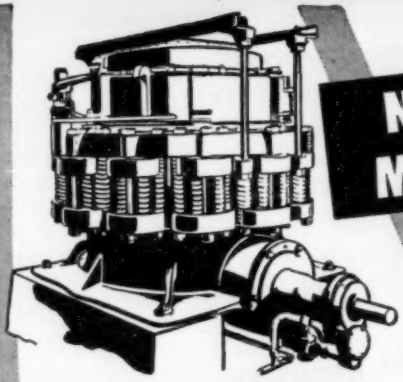

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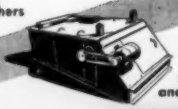

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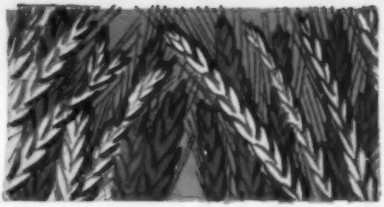

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Business Trends

PARTIAL ECONOMIC MOBILIZATION has begun in the U. S. Fewer exports, more imports will be among the most immediate effects of the increased armament effort. Among increased imports will be strategic raw materials and possibly some consumers' goods. Export of machinery will be affected first, with scarce consumers' goods next on the list.

The dollar gap will be narrower, but smaller U. S. exports will spell hardship to foreign countries. Exports necessary to build up the military might of the Atlantic Pact nations, however, will receive high priority. U. S. Congress passed the $1.2-billion arms aid bill with only one dissenting vote—and will enlarge the program. Favorable action is expected—and quickly—on President Truman's request for an additional $4-billion arms aid.

War spending is being stepped up gradually. Time is needed to make the necessary plans, issue orders, convert production. But by the end of the year, the estimated rate of spending on armaments will be $4-billion higher than now. By mid-1951, we may be spending $20-billion on armanents—$16-billion more than at present. And that does not include uniforms, supplies, and the like.

War industries will expand to fill the increased military orders. The aircraft industry will need a year to triple its current output. Railroad freight cars also are high on the priority list. But shipbuilding is not expected to expand rapidly unless war becomes an immediate possibility. The U. S. has still more than 2,000 World War 2 ships laid up. Some are back in service.

Steel and machine-tool industries are expanding. The steel industry is planning to add 6.4-million tons of steel capacity within 2 years, at a cost of over a billion dollars. The machine-tool industry also is expected to reach a new peak in output within 2 years. Machine tools are essential to war production, as many peacetime tools cannot be converted to war purposes.

Civilian production will be cut by armaments. About one half of civilian production is directly affected by war demands—with construction and consumers' durables, such as automobiles and electric appliances, in the first rank. As military output is stepped up, civilian production will be increasingly limited.

But business will boom in spite of controls and higher taxes. By the end of this year, the Federal Reserve index of production may reach 215, as compared with 200 last July and 163 in July 1949. Civilian industry will try to build up stocks and step up its purchases of new plants and equipment.

Prices will rise. Even before the rearmament program, prices were edging upward. Now an increase of 7% in the wholesale price index by the end of year is likely. And prices may go up faster. Nonferrous metals, rubber, cotton, and other basic commodities began a rapid advance just after the start of the Korean confict. And other prices followed. There will be no runaway inflation, but both

Business Trends (Continued)

military and civilian spending will push prices upward in spite of controls. New labor contracts to be negotiated this winter and next spring will put more pressure under prices.

FASTER TRADE WITH A FREE WORLD is a prime U. S. objective. In spite of the armament program, foreign trade and solution of the dollar shortage remain high on the government's priority list. The Gordon Gray committee is working on plans to meet dollar needs after the end of the Marshall Plan. And meanwhile the government is taking positive steps to promote trade.

A more liberal foreign-trade-zone law permits importers, for the first time, to exhibit and manufacture goods within the zone without payment of U. S. import duties. Under the previous law (McG-H Digest, Apr, p17), processing was limited to inspection and manipulation.

More business is being done by the zones, which last year handled $200-million worth of goods. The opening of a new zone at San Antonio, Texas, brought the total to six. Other zones are being expanded to handle more goods.

The traiff-simplication act, brought before Congress some months ago but not considered because of pressure of other legislation, is being pushed by the administration. The chances of passing the bill are now good.

U. S. investments abroad mount, give more dollars to foreign countries. In spite of the uncertain world situation, private U. S. investment abroad increased and the Export-Import Bank may soon be authorized to guarantee foreign investments (see p20).

GERMANY AND JAPAN emerge as chief competitors of U. S. and Britain on world markets. Both Germany and Japan have staged a spectacular recovery—partly with U. S. help—and both plan further export drives. With U. S. exports limited by the arms program, German and Japanese exports will grow.

Japan has conquered the Eastern textile markets to become the world's leading cotton-cloth exporter. Expanding Japanese machinery exports are another threat to British and U. S. producers. Large orders are coming from India.

German steel, machinery, chemicals are regaining their place in the world market, undercutting Britain and U. S. Locomotives for the Union of South Africa, toys and rayon for the U. S. give an idea of the range of German products going into export.

German-Brazilian trade agreement opens a new market for German goods. Last year, Brazil bought $438-million worth of U. S. goods and made purchases of $133-million in the U. K. Now, under the new barter terms, Brazil will swap within a year from the signature of the treaty $220-million worth of coffee, cotton, and raw materials for German machinery and industrial products.

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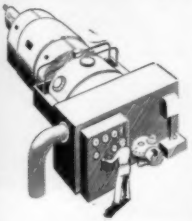

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Washington Report

U. S. WAR MACHINE is beginning to hum again. The build up here and in allied countries will continue perhaps for years—until war comes or until Communism retreats.

Truman's $10-billion request was just a sign of how serious Washington took the Korean attack. The figure means nothing. Whatever the cost of total defense, Congress will meet it. Mounting inflation will bring mounting controls. First came allocation of scarce raw materials, inventory controls, tighter credit restrictions, and cut-backs in civilian production. Next will come price controls and rationing. With war will come manpower controls.

Limited mobilization in the U. S. changes the whole economic outlook in Western Europe. Initially, booming U. S. demand for raw materials from European financial sources will ease the dollar problem. Long-term contracts for strategic materials to be bought at prices above the going market if necessary have been authorized. Demand for Western European exports in the U. S.—things like British cars—soared in the weeks after Korea.

But Western Europe will have to mobilize, too. That could easily undo the fine fabric of postwar recovery. Consumption levels in Western Europe are still not at a healthy level. Diverting consumer goods production to defense production could bring back the inflationary spirals and the depressed standards of living that inspired the Marshall Plan.

U. S. aid to Europe will shift nevertheless drastically to arms. First extra installment will be at least $5-billion. Some of this will go for direct dollar incentives to Western European countries willing to produce more of their own defense needs.

The fate of Marshall Plan itself is much in doubt. Congress is threatening every proposal that does not contribute directly to military defense. You can virtually forget about the last year of the program. Administration officials are worried that the need for sound economies in the West will be lost in the scramble for guns. There will be strong pressure for continued economic aid, but the objective will shift from Europe to Asia (see p20).

CAN THE TENSION BE RELAXED before war breaks out? A depressing number of officials here are decided it cannot. But if no further action occurs before the battle smoke clears in Korea, hope will rise again.

An attack in Europe means World War III. That much is sure. The same goes for Iran or anywhere else in the Middle East. But more outbreaks in Asia probably only mean more rescue operations—more mobilization in the U. S.

A deal with Russia is possible after Korea is settled. First step would be admittance of the Chinese Communists into the United Nations. Only politics

Washington Report (Continued)

prevented this before Korea. Risk of a U. S.-Chinese war should push it through afterward. This might lead to an all-Asia truce with Moscow. The British have been exploring the matter with the Kremlin.

Question is: What could Washington settle for? Even a limited war-time economy can become mighty unpopular at home if there is no prospect of shooting in the immediate future. At the same time, it would be suicide for any administration to go back to the paper defense policies that characterized the pre-Korea U. S. Chances are the United Nations is the best spot to look for ways of easing the tension.

Political repercussions of getting caught unprepared in Korea are going to cost some high Washington officials their jobs. Sure to go is Defense Secretary Johnson. Secretary of State Acheson's days are numbered too. Averill Harriman, special advisor to the President on foreign affairs, is Acheson's most likely successor. His policies would not differ from Acheson's in any significant detail. But what sort of a settlement he might be able to negotiate with the Russians is far from clear yet.

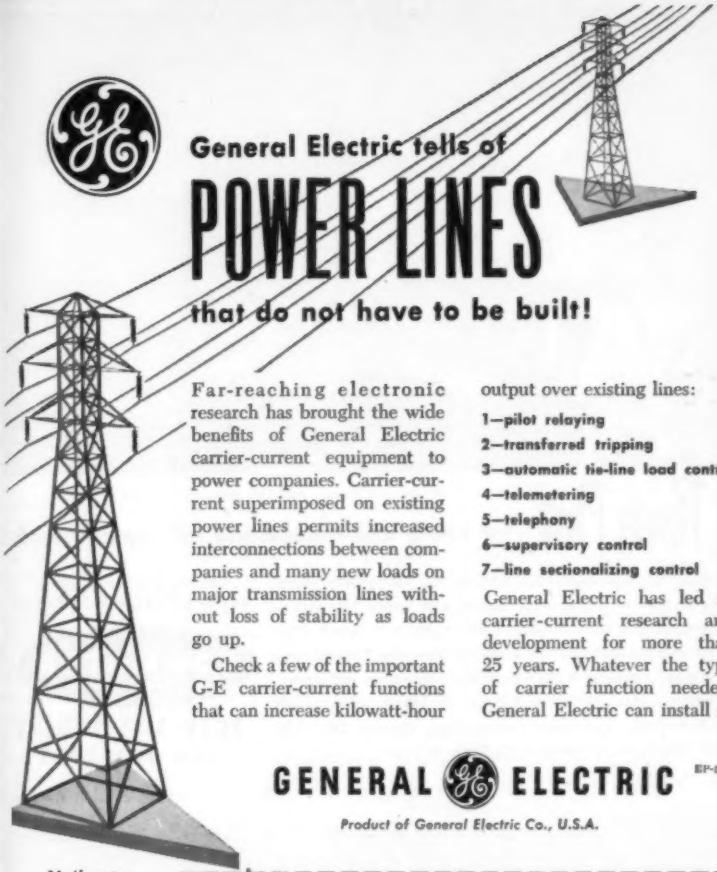
THE SCHUMANN PLAN will probably be in operation by early 1951. But Washington officials are not too happy about it.

The plan will mean forging a huge cartel out of the French, German, Belgian, and Luxembourg iron and steel industries. This would not bother Washington too much if the political results of a close Franco-German union could be realized. But feeling in official quarters is that the pooling idea may not do any more than set up another type of cartel.

The pooling idea is spreading to other fields in Europe and that worries Washington too. French and German agricultural and power interests have indicated they want to merge. Washington officials see prospects of a new arrangement to justify the use of trade restrictions currently being outlawed by the European Payments Union. Pools might expand the internal market some. But plenty of restrictions could be set up that would defeat the purposes of freer trade.

Most officials are considerably relieved Britain did not jump into the Schumann pool. They would rather see Britain's steel industry compete with the cartel than join it.

EXPORT-IMPORT BANK LOAN to Australia can be expected as a result of Prime Minister Menzies trip here. State Dept. feels Australian development could go ahead a lot faster with some additional capital. Size of the loan will be in the neighborhood of $200-million. State Dept. will have some harsh words about Australia's post-war aversion to private U. S. investments. But this will not prevent signing of the long over-due treaty of friendship, commerce and navigation.



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Atomic Energy 1950: A Report

Russian competition heralded atomic era's second phase. Nuclear power and the H-bomb occupy a key position in this evaluation of atomic progress

U. S. ATOMIC MONOPOLY no longer exists. The Russians have atom bombs. They proved it.

How will America's own atomic energy program face the challenge now that its monopoly is over? To begin with, the U. S. Atomic Energy Commission (AEC) is now a well-integrated team doing its job with a smoothness few industrial organizations can rival. AEC is pushing ahead on a broad technical front towards real nuclear engineering.

This summer a new commission will face two major managerial jobs:

• It will have to make a drastic re-examination of AEC's work, and adjust to a period of atomic competition.

• It will have to find a way to keep AEC from foundering under the defects of its virtues. The organization is losing its pioneering spirit.

A year ago the AEC was ready to keep producing bombs at a gradually increasing rate. With 4 or 5 years more of monopoly ahead of it, it could count on possessing an irresistible stockpile of weapons by the time it had to worry about foreign competition (Mc-H Digest, May '48, p50). Meanwhile, AEC would start on a systematic search into the whole field of atomic engineering; a few years, it was believed, should knit atomic energy firmly into the colossal structure of American technology.

Then, in the course of a few months, all these plans were upset by four shocking realities:

1. A congressional investigation revealed a deep public distrust of the whole mysterious atomic organization.

2. The Fuchs case left the AEC completely uncertain about what actually is secret and what is not.

3. There was no longer doubt that the Russians had built a bomb.

4. President Truman ordered AEC to make a hydrogen bomb.

All these were signs of a new phase of the atomic era. The four shocks also dictated immediate action.

Briefly, an atomic explosion occurs when two sub-critical size masses of

uranium 233, uranium 235, or plutonium 239 are brought together into one critical mass.

Ever since the war, AEC weapons researchers have been improving the efficiency of this process—getting more atoms to split before the expansion created by the explosion itself stops the chain reaction. Obviously, there is a definite limit on power. Each of the two masses to be assembled must be smaller than a critical mass. Larger and better bombs must come from other nuclear processes.

Towards a Superbomb

Much energy is released when protons or lightweight atoms come together and form heavier atoms. Temperatures around 20-million deg. F. are needed for fusion. During the fraction of a second that a fission (uranium or plutonium) bomb is exploding, temperatures of that order are generated.

To the AEC it appeared that they could pack light material around an A-bomb and multiply its effectiveness many times.

In 1948, the weapons-research center at Los Alamos began a serious investigation of fusion processes—of how much energy would be released by making helium from hydrogen.

Last fall, Los Alamos submitted a report on its findings. With moderate optimism, it said the thing was feasible. AEC's scientific advisory board recommended against devoting any substantial effort to the possibility.

To the military the idea of a superbomb looked good. A bitter debate began, with the military eventually winning.

What was the fighting about? Why would anyone oppose a superbomb?

Actually the debate centered around two different bombs, neither, strictly speaking, hydrogen bombs. Of these two, the bomb that would be valuable probably will not work. And the one that is likely to work is of questionable value. Here is why:

The two materials that could be made to fuse into helium at high temperatures are: (1) deutrium and (2) tritium. Both have the chemical properties of hydrogen but differ in mechanical and nuclear properties.

The high temperature required can be maintained only for a fraction of a second. The fusion reaction must be completed during that short interval. Two deutrium atoms can fuse in 0.0003 sec. This is thought to be too slow.

A tritium reaction is more than 25 times as fast and looks hopeful. Unfortunately, tritium does not occur in nature. It must be manufactured in uranium piles. Deutrium as a nuclear fuel is inexpensive and easily obtained.

Other disadvantages of tritium are: (1) it must be liquefied by cooling to within a few degrees of absolute zero and (2) it is radioactive and cannot be stored indefinitely.

Where the Superbomb Stands

Production of superbombs would require an industrial effort like this:

1. Production of half a ton of lithium metal per bomb.
2. Several atomic reactors to transmute an isotope of lithium into tritium.
3. Much development work on extreme refrigeration.

An estimated 2 years is required to make enough tritium for one superbomb using a reactor similar to the one at Hanford.

How vigorously has the AEC pursued the problem?

It is not yet spending any large sums. However, Los Alamos is operating full scale on the research and development side of the hydrogen program.

Is the hydrogen bomb America's answer to Russia's atom bomb? The answer is no. This country's real and significant

FRONT COVER—An air view of one of the giant production plants at the Clinton Engineer Works, Oak Ridge, Tenn.

answer to the Russian achievement lies in an intense speedup of plans for expanded production of the two A-bomb explosives, U-235 and plutonium. Bomb production is probably substantially higher than 50 a year.

Construction originally expected to be finished in 3 to 5 years is being done in 2 years. Two gaseous diffusion plants for producing uranium are under construction. Two reactor piles are being built and a third may be modified to produce a supply of tritium for the H-bomb project. These piles are in addition to the three revitalized ones operating at Hanford.

Atoms for Power

Late in 1948 the AEC approved construction of four new-type reactors. The experimental breeder reactor (McG-H Digest, May '48, p55) is a small, comparatively cheap machine intended to test the possibility of breeding fuel. In addition, it will operate at a high temperature. Its heat will be removed by circulating metal and so provide a small demonstration of power.

The materials-testing reactor is designed to test construction materials. The same intense neutron bombardment that hits everything inside a high-power reactor will hit these materials. Thus it will help immensely in the design of other reactors.

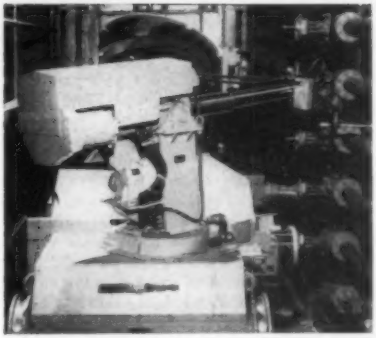
A submarine engine has the highest priority among all the reactor projects. The Navy department is already designing a submarine to carry it.

A pilot model of a central-station powerplant was supposed to have been under construction by now. This project has been cancelled—a casualty of the Soviet bomb.

Atom Power for Industry

To the business man what does all this mean? Should he forget atom power and consign it to the military? It looks that way.

Actually, though, practical atomic power is closer today than ever before. But not as huge central-station atomic power plants, as everyone had thought. As long as coal and other inexpensive fuels remain plentiful, atomic energy will not enter the power field. Perhaps areas where fuel shortages exist will see atomic power in the near future (McG-H Digest, May '47, p11). But the present prospect of saving a mil or two per kilowatt-hour is not terribly exciting.



ONE ARMED "ROBOT" can open and close doors, turn valves and take apart and reassemble complex machinery in unsafe radioactive areas. Robot is remote controlled—Chem Eng, July p 137

What is exciting are the things atomic power promises to do that no other fuel can do at any price—particularly in the transportation field.

Petroleum came into use as a fuel, when it cost more than coal, because it was infinitely more convenient than coal —for moving power plants. Today the Navy, soon perhaps commercial users, will pay a high premium for the great convenience of a practically weightless atomic fuel.

In a decade or two, it may seem archaic and absurd that any large vehicle should devote carrying capacity to hauling its own fuel around, or should have to stop to take more fuel on.—Business Wk, July 8, p58

Aid to Asia—Answer to Reds

Here is what you can look forward to for Asia and Western Europe in the next few years if Korean fighting does not spread beyond Korea

A MARSHALL PLAN for Asia looms in the wake of the Korean fighting—if World War III does not come first.

You will see the outlines in this month's report of Gordon Gray, special advisor to President Truman on the "dollar gap" problem. Gray's men figure on a $2-billion annual outflow of development capital from the U. S. to Asia, Africa, and the Near East after 1952. The figure covers grants, loans, and private investments.

The Korean outbreak means that the capital will start flowing well before 1952. But the amount may not be much larger. Asian countries are in no position to absorb large amounts.

And war in Asia means the U. S. taxpayers will provide most of the money. Administration planners had fond hopes that post Marshall-Plan development could be financed largely by loans and private investments. But in Asia at least, there is no prospect of an investment climate likely to attract private investors or even sound loans.

Planned aid programs for Asia, Africa, and the Middle East may drastically curtail or eliminate entirely the last year of the European Recovery Program. Exceptions: aid to Austria, Germany, and Greece—too many war scars left.

Europe in Good Position

Most of Europe now can get along without any more extraordinary financial aid. When the Marshall Plan was launched back in 1948, U. S. aid made up about 5% of Western Europe's gross national product. Marshall Aid now has been cut in half, and Western Europe's gross national product has risen 25-30%.

Increased defense needs for Western Europe make this argument more binding. Congress will not appropriate $2-billion a year for Western Europe's defense and then appropriate $2-billion more for its economic health.

But if Washington thinks Europe is off the economic sick list, it also thinks Asia is in a critical condition. In Europe the need was primarily for reconstruction and goods to keep the factories going. In Asia the need is for new capacity. Virtually no Asian country has any margin of economic resources available for building industries or improving public utilities.

Action Needed Now

As in Europe, the U. S. will tackle the job in Asia because the need of countering Communist promises with tangible action has been proved beyond a shadow of doubt. Korea proves that there is precious little time to start.

The U. S. will also tackle the job in the interests of Western Europe. Malaya, Indonesia, and India provide Western Europe with dollar-earning raw materials. High demand for rubber, tin, and jute in the U. S. has meant dollars to Britain and Holland.

But taking raw materials out of Asia and selling consumer goods in return will no longer keep this source of dollars open to Europe. What is needed is development—more simply, a higher standard of living. That is the demand of the Asian revolution that swept over China, India, and Indonesia. The Chinese proved that if the West offers nothing, the East will take its chances with communism.

The first need in virtually every Asian country is for agricultural development—better seeds, production of more and better fertilizers, manufacture of farm implements, better transportation, and irrigation systems.

Point-Four technicians can help start projects in these fields. But technical assistance without capital investment will not help much. And for the first few years, the bulk of the capital will have to come from the U. S. Government. Private investments cannot be harnassed to this kind of work.

Washington's objective in the long run is to build an institution that can handle development programs with private capital and loan money. The candidate is the Export-Import Bank.

In the loan field, the bank's resources are sure to be expanded radically in the next year or two. Right now the bank is using all but $800-million of its $2.5-billion authorized.

The bank's second long-range job will be to guarantee private investors against non-business risks—expropriation, convertibility of profits, and war risks. A bill passed by the House of Representatives this session authorizes the bank to do this up to $250-million.

Government Guarantees Unpopular

So far, the American business community has shown little enthusiasm for government guarantees (see McG-H Digest, May, p71). Most economists figure it will take 3 to 4 years before the guarantee idea is really accepted by businessmen in general.

And it will not be much before then that U. S. private investments abroad will show much of an upswing. Because guarantees or not, little private capital will be going abroad while the U. S. is on even a limited wartime economy.

Direct private U. S. investments abroad last year maintained the postwar average of $1.2-billion. About $700-million in new and reinvested earnings went into oil. But oil is not found in the places the administration would like to see most development capital go. Of the $700-million in new capital invested abroad last year, oil accounted for more than 80%. The other $500-million in direct private investments were made from reinvested earnings of U. S. businesses abroad.

Shifting aid programs from Europe to Asia, Africa, and the Middle East does not mean that Washington is through watching Western Europe's economic health. There will still be a gap of $1.5-billion between Western Europe's dollar income and outgo in 1952.

What Will Fill the Gap?

Part of the gap will be filled by general economy measures. But a scheme is under way to open up a new source of dollars. The administration plans to ask Congress to allow Western European manufacturers to compete for orders financed by Export-Import Bank loans.

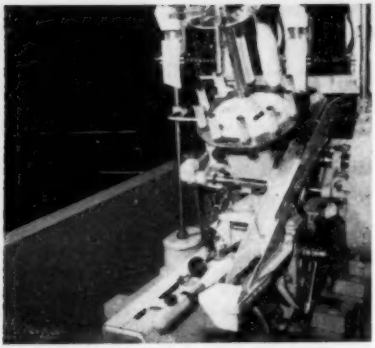
Under its charter, bank loans are tied to the purchase of U. S. goods. When the bank was founded in 1935, its objective was to boost U. S. exports—a casualty of the depression.

But now that U. S. policy is to increase the supply of dollars in the world, the administration thinks the charter should be changed. Untying Export-Import Bank loans do more than provide Western Europe with another chance of earning dollars. At the same time, it would help bring Western Europe's industrial costs down by direct competition with U. S. manufacturers.

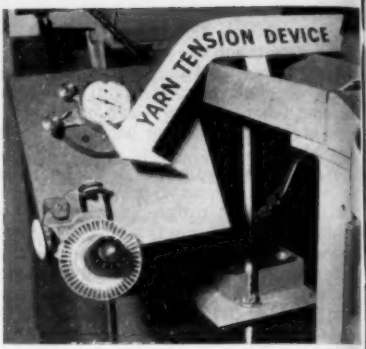
Getting Congress to revise the bank's charter will be difficult. Most Congressmen regard the bank's funds as "taxpayer" money; letting foreigners compete for it will not be welcomed.

A Political Answer

But the Administration has a politically attractive answer to this. If Western European manufacturers provide much of the machinery and equipment financed by Export-Import Bank loans, the money will probably come back to the U. S. in the form of increased orders for farm products. And selling farm goods abroad is worth many more votes in Congress than selling machinery and equipment.



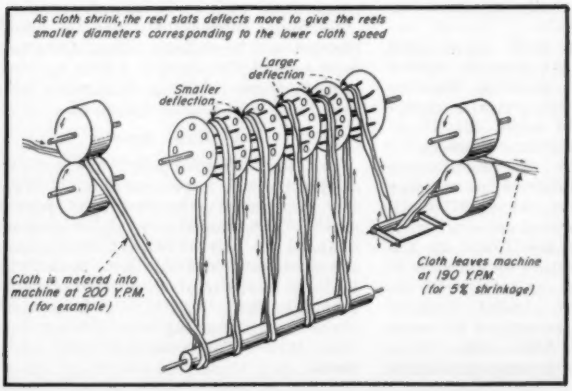
CREELING AND TYING device permits winding of bobbins from bobbins, eliminates coning. No adjustments are needed when counts are changed. Maker is Whitin Machine Works.—p116



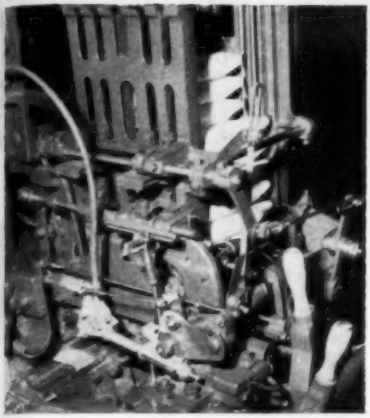
YARN TENSION device developed by General Electric Co. does not exert tension by pressure. Resistance on yarn passing around nylon-plastic wheel is exerted by magnets.—p143

New Textile Machinery Review

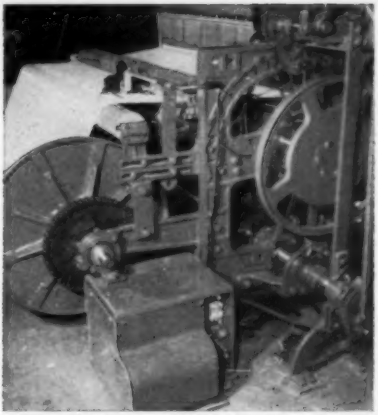
A few of the many new advances in textile machinery are shown here. These machines represent the latest development in a field that has steadily progressed from mule-powered equipment to electronically controlled processes.—Textile World, July


As cloth shrink, the reel slats deflects more to give the reels smaller diameters corresponding to the lower cloth speed
Larger deflection
Smaller deflection
Cloth is metered into machine at 200 Y.P.M. (for example)
Cloth leaves machine at 190 Y.P.M. (for 5% shrinkage)

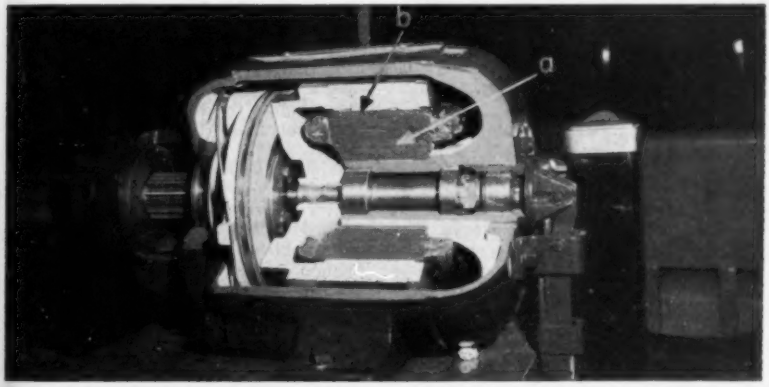
METERING SQUEEZE ROLLS processes, without tension, fabrics that shrink or stretch. Featured in the machine are eight flexible-rubber slats, mounted between two stainless steel flanges. Tension in fabric deflects reel slats, allowing reel to adjust its speed to that of cloth. By deflecting, the reel becomes, in effect, smaller and pulls cloth at a lower rate of speed, thereby relieving tension. Machine was developed by the James Hunter Machine Co.—p137



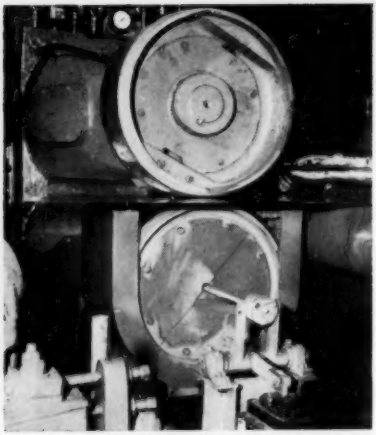
VACUUM FILLING-END HOLDER on Crompton & Knowles S-6 loom has swinging mount eliminating breakage of reverse-wound filling on first pick after transfer. First-pick tension on filling is established before filling enters shed.—p124



ELECTRONIC LETOFF on C&K S-6 loom controls warp tension. Tension-measuring unit electronically actuates motor that drives warp beam at proper speed. Unit is particularly useful where large-diameter beams and fine yarns are used.—p125



DIEHL POWER TRANSMITTER combines rotor, clutch, and brake in one compact unit. Motor design is unconventional. Stator is at *a*, rotor at *b*. Because clutch is on motor, it revolves about 100 times faster than a normal loom clutch, minimizing effect of slippage on loom operation. Clutch movement from drive face to brake is short.—p150



SAMPLES FAST STRIP

Flying sample punch, installed on tinplate line at Weirton Steel Co., cuts samples from strip moving at 2,000 fpm. Upper drum has fixed die, and lower drum a movable punch that is extended by solenoid acting through toggle linkage inside the drum. Machine can take sample anywhere across strip width.—Steel, June 19, p116

Evaluate Packing Retainers

The AT&SF railroad conducted tests with high-speed motion pictures and still pictures to evaluate packing retainers and so prevent hot boxes by eliminating waste grabs. These tests showed the extent of the movement and dislocation of the journal and bearing with respect to the journal box during road movements and switching impacts.

This dislocation causes the waste to rise on the journal and wedge between the journal and bearing. Waste retainers reduce this action. Photographs showed that impacts during normal road movements were comparable in severity to switching impacts.—Rail Mech & Elec Engr, June, p349

Structural Framing Eases Installation, Adjustment

Layout and drilling were eliminated by making the framing structure of continuous channel Unistrut for a transformer bank at East Tenessee Baptist Hospital in Knoxville.

At the back of the transformer bank are four upright members anchored to the wall. These uprights support a network of horizontal and vertical members spaced to accommodate primary cable terminals and disconnect switches.

Similar uprights are in front of the bank. Secondary cables are racked in porcelain cable clamps mounted to the uprights. An overhead rack of Unistrut channel carries secondary cables to the distribution board.

Final adjustment and alignment of switches and insulators were quickly made by simply loosening a few nuts, sliding equipment along the channel, then tightening the nuts.—Elec C&M, June p79

Time Study Data Computed

A factory employing a number of automatic machines, which frequently change their loading and running time cycles, can compute the combined production of each machine without a large staff of statisticians. This tedious work is now eliminated by an electronic device.

The Time Study Computer, made by Potter Instrument Co, completes payroll or production studies much faster and with unbiased accuracy. It is operated by one girl and requires no more skill than an adding machine.

Each individual loading and running time, which has been determined by the usual time-study methods, is set into the computer. Press a button and the computer simulates operator and machines for any preset period, at a speed of 1,000 elements of time per sec.—Prod Eng, June, p148

How to Prepare Carbides for Metallographic Examination

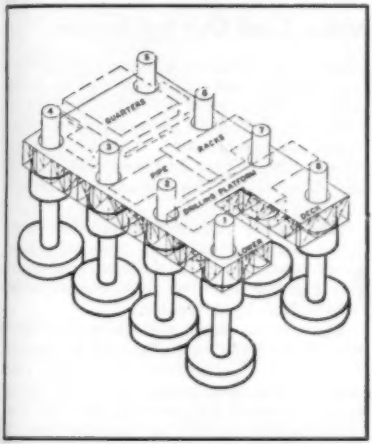
Cemented carbides require special preparation techniques. Diamond powder is the only practical abrasive for polishing carbides because ordinary abrasives are too soft.

A carbide specimen should first be ground with a 220-grit, resinoid-bonded diamond wheel on a surface grinder. Then it is polished on the first polishing lap, which is a disk of photographic paper cemented with emulsion side down to a standard bronze lap.

The paper is impregnated with 6-micron diamond particles by spreading over its surface a film of diamond compound (diamond particles in paste compound) and spraying with kerosene. The specimen, after 30 sec. or so of polishing, is dipped in solvent to remove the kerosene and washed with soap solution.

The polished specimen is examined carefully for porosity before etching. Higher reflectivity of unetched specimen gives sharp contrast to void areas.

Standard etchant for carbides is Murikami's regent, or alkaline ferricyanide. It consists of equal volumes of 10% NaOH and 10% $K_3Fe(CN_6)$. Solution temperature should be 100-120° F. Another satisfactory etchant is alkaline potassium permanganate, which gives better contrast between phases but is subject to staining and over-etching.—Iron Age, May 25, p71



UNIQUE OFFSHORE DRILLING RIG

This odd-shaped structure may someday be a familiar sight in offshore oil-well drilling. It is the Sun-Seadrome rig—an outgrowth of the Seadrome intended as mid-ocean airports. Rig is self-docking and jet maneuvered. Eight buoyancy tanks with water ballast carry structure's weight. Deck may be raised or lowered by hydraulic jacks on each column. Size: deck length 220 ft.; deck width 134 ft.; deck height above water 28 ft.—Oil & Gas J, June 22, p192

Economical Part Production

Most parts makers are faced with the problem of a wide variety of products combined with a mixture of small and large lots. Despite variability in product design and the size of a given order, the parts maker must serve the customer on time and at competitive costs. Solution lies in flexible production lines and machines and in skillful planning.

The basic steps for economical production are outlined below:

1. Planning of plant layout—arrangement of production centers.

2. Production scheduling in economic lot sizes, planning in advance with a firm schedule for each month.

3. Organization of materials handling suited to the operation.

4. Palletizing of all parts and materials—incoming production banks and shipments.

5. Close cooperation between engineering and production. Product design should allow for maximum utilization of basic castings, forgings, and standard tools.—Auto Ind, June 15, p44

New Foundry Cupola Design Incorporates Water Cooling

Reduced wear of cupola lining has been the result of development work by Ford Motor Co., Ltd., England. After a series of design changes in the melting zone, the final form was an inclined face and a system of water cooling.

Water jackets replace the refractory lining on the inclined face to a 30-in. height above the tuyeres. The coolers have corrugations on the exposed face. Corrugations may be filled with ganister.

Water circulation of 2,500 gph. is enough for a cupola of 37 in. in dia. at the stack. Results: saving in refractory, reduced labor repair costs, possible operation on multiple shifts.

With the refractory problem in the melting zone taken care of, attention was transferred to the lining below this section. The answer was to eliminate the well by bottom redesign and to tap continuously.

Blast-furnace grade of coke can now be charged without efficiency loss. Previous precautions for preheating cupola are unnecessary, and blowing may begin as soon as the coke bed is ignited and charging finished. As total area of exposed wall refractory is low, less repair is needed than before the change was made.

Ford also has improved desulphurization of low-carbon irons by use of a basic cupola. Lining is dolomite bricks. The cupola melts low-carbon metal that is run directly to an electric furnace.—Foundry, June, p82

Radical Power Station

Construction of an underground power station partly financed by an International Bank for Reconstruction and Development loan (McG-H Digest, March '50) is to start soon in El Salvador. Unusual feature of the power station is the horizontal placement of turbine driveshafts. The turbines are to be placed directly under vertical penstock shafts. Large economies in design and construction of the plant are expected because of this arrangement.

Advantages claimed are; power-station chamber height is about one-half that required for a vertical installation; elimination of elbows in the penstock, resulting in a higher efficiency; shortened time of construction; cavitation and pitting will be almost eliminated. Initially, the power station will be equipped with two horizontal-shaft hydraulic turbines driving two horizontal generators. Ultimately, five such units are planned.—Eng News-Rec, June 15, p44.

More Coal Out by Augers

Five-ft. dia. auger used by Grafton Coal Co. extracts coal from strip mine highwall at the rate of 800 tons per shift (see McG-H Digest, Feb '49, p17). Rigs—two are in operation and one is under construction—were designed and built in the mine shop. Four men operate the auger.

The rig is constructed of steel pipe and rides six dual rear ends of abandoned trucks. It is 72 ft. long and operates from a beam at least 80 ft. wide. It is moved by a tractor.

The 100-ft. deep hole is mined in 5 min. Moving the rig takes only a minute. About 10% of extraction is cut, the rest being broken into lumps up to 24 in. in dia. About 80% ranges from 2-24 in. The 102-ft. auger is built in two sections. A 62-ft. section includes cutting and breaking section; the other 40 ft. is screw flight only.

Rig has been operating in a 6-8 ft. seam, practically level and free of local rolls. When a clay vein is hit, the loading truck is pulled out and clay spilled on the ground. Pillars between holes average 4 in. thick. But if holes overlap, there is little danger of roof falling.—Coal Age, June, p75

MILK FOR CHEESE is heated in ten 20,000-lb. vats. Over each vat, two agitators move back and forth from center to ends.

CHEDDARING is done after curds form and are cut to remove whey. Cheddaring—cutting and piling—continues until moisture is 44%.

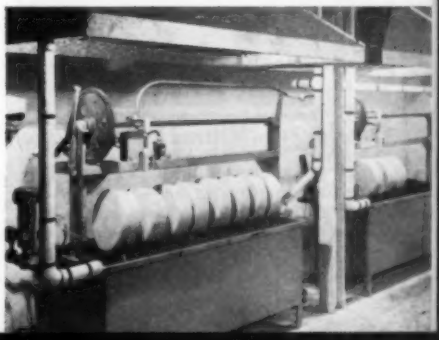
MILLING is done by cutting curd layer into 1-in. slices and feeding through curd mill, which chops them to ⅝x2-in. pieces.

How to Make Good Cheese

New $1½-million cheese factory of Tillamook County Creamery Assn., Oregon, is an outstanding example of good planning and efficient utilization of the 600,000-lb. of milk received daily. Cheeses are Cheddar and Club. Cheddar is made with rind or packed in Pliofilm. The Club cheese is made by blending rindless and triplet cheeses. —Food Ind, July, p44 and 102.

CURDS are filled into hoops and placed in hydraulic presses, which remove remaining whey and form cheese to homogenous mass.

PRESSED CHEESE is stored for 3 days at 50° F., dipped in paraffin, cured at 50° for 3-6 wk., coated with wax, and aged at 36°.



Convention Calender

(Equipment Exhibited)

Sept. 25-27—National Electronics Conference, Chicago, Ill.
Oct. 2-6—National Hardware Show, New York, N. Y.
Oct. 10-12—Industrial Packaging and Materials Handling Exposition, Philadelphia, Pa.
Oct. 16-20—National Safety Congress and Exposition, Chicago, Ill.
Oct. 23-27—American Society for Metals National Metal Congress and Exposition, Chicago, Ill.
Oct. 23-27—National Business Show, New York, N. Y.
Oct. 29-Nov. 3—Conference of American Bottlers of Carbonated Beverages, San Francisco, Calif.
Nov. 27-Dec. 2—Exposition of Power & Mechanical Engineering, New York, N. Y.
Jan. 15-18—Plant Maintenance Show, Cleveland, Ohio.
Jan. 22-26—Tenth International Heating and Ventilating Exposition, Philadelphia, Pa.
Apr. 16-18—Conference of American Society of Lubricating Engineers, Boston, Mass.
Apr. 30-May 4 — National Materials Handling Exposition, Chicago, Ill.
Apr. 16-21—National Packaging Exposition and Conference, Atlantic City, N. J.

To anyone interested in any of these expositions, either as a possible exhibitor or visitor, the McGraw-Hill Digest will be glad to furnish additional information.

Conductor Vibration Fatigue

Power transmission lines from Boulder Dam to Los Angeles have recently experienced eight cases of segment failure from conductor vibration set up by the wind. Early laboratory investigation showed that the amount of energy required to vibrate the cable at high amplitudes decreased as the test continued.

As all but one failure occurred on cable that had been in service for 15 yr., it is now believed that the slight bending to which the cable has been subjected has made it more flexible. Therefore, the cable has become more subject to vibration.

Complete vibration characteristics are being determined. The investigation also includes a study of the proper characteristics of a suitable vibration dampener. —Elec West, May, p62

Panels of Phenolic Resin and Sawdust Replace Wood

Sawdust is no longer just a waste product. In proper combination with thermosetting resins, sawdust becomes a basic component in many ways superior to plywood. Prespine, developed by Curtis Companies, Inc., consists of approximately 93% powdered wood and 7% phenolic resin binder.

Finished panels resist warping, swelling, shrinking, and heavy impact blows. Color closely simulates that of pine. Flexural strength compares favorably with solid wood of the same width and thickness. It can be readily glued and painted and has good weather resistant qualities.

The rough wood waste used in the manufacture of Prespine includes shavings, sawdust, and waste pieces of lumber. Larger pieces are first reduced to coarse sawdust. The coarse sawdust is then run through a hammer mill, which reduces it to finely divided wood particles. Dry phenolic resin is added by weight.

After mixing, the batch is next placed in a press in which it is compressed to one-sixth its initial thickness during molding. Upon completion of the molding process, panels are removed from the press and trimmed to size. Panel sizes, at present, are limited to 4-ft. squares.—Mod Plastics, July, p64

Prestressed Concrete Needs High Prestressing Value

High steel stresses are necessary for prestressing concrete. Otherwise, the benefits are lost because of shrinkage and plastic flow of the concrete. Pre-stressing has proved practical with steel tensioned initially to over 100,000 psi.

Despite this experience, some makers of precast concrete structural members are prestressing to only about 20,000 psi. In a relatively short time, most of this initial stress will be lost. Shortly after the steel has been tensioned to 20,000 psi., load tests may indicate that the beam has ample strength and stiffness. If a load test is performed on a similar beam several months after prestressing, tension cracks may appear under relatively low loads. Failure may occur considerably earlier.

With tension in the 20,000-psi. range and adequate bond, the best that can be expected is to have the member act as an ordinary reinforced concrete beam. Consequently, any claims that such members are prestressed may be either exaggerations or misrepresentations.

Before precast, prestressed concrete structural members are purchased, buyers should check to determine that the long-time prestress in the concrete will be adequate to counteract design tensile stresses.—Eng News-Rec, June 22, p21.

Gasoline in Pellet Form

Shoveling piles of gasoline and kerosene around like pea coal and studying new uses for these pelletized water-insoluble liquids are routine at Southwest Research Institute.

The Carburolith process to make the balls of fuel was developed in France after the war. The Institute is conducting pilot-plant study.

The pellets are not capsules. Made of small, highly porous spheres of algin (a derivative of brown seaweed), they resist leakage, prevent vaporization loss. They are 98% liquid by volume. Favored sizes are ⅛–½ in. in dia.

Pelletizing is inexpensive and simple. A water solution of algin emulsifies the oil product. The emulsion is then mixed with calcium chloride to form the pellets.

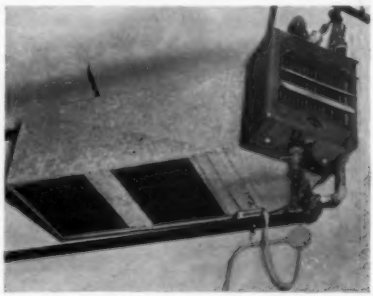
A distinct possible commercial application is handling and storage of liquids in solid form to reduce fire hazards.—Oil & Gas J, May 25, p94

Removes Sulphur from Iron

Over 90% of the sulphur is eliminated from iron by a special ladle technique at A. M. Byers Co. Cupolas are tapped into an open-top lip-pour ladle, and sodium hydroxide is added during the tapping. The hydroxode melts to form a desulphuring slag.

The hot metal with its layer of slag is poured into a hooded-top ladle, thus intimately mixing iron and slag. This results in unusual sulphur reduction.

The metal is then poured into a third ladle for transporting to the bessemer converter. The hooded-top ladle retains the slag.—Steel, June 19, p108



FILTERS SAVE HEATER

Here is a way to save on heater maintenance. A filter box hooked to the air-intake side of unit space heater removes dirt and dust from air before it passes through heater.—Oper Eng, June, p35

Marketing Manager Heads Modern Sales Organization

Starting in 1947, a new marketing approach was adopted in General Electric's affiliated companies. A marketing guide determines the scope, functions, and procedures to be followed by marketing departments of the company. It brings into being the marketing-manager plan of organization. At the head of the department is the marketing manager. He emphasizes detailed sales planning, control of marketing methods, and study of the market. He is responsible for distribution, sales organization, and sales planning.

Sales manager now handles the actual selling and field-sales organization. The new marketing manager controls planning of products, making production scheduling requests, and finished-goods inventory. A more effective coordination between various company units in the matter of marketing policy is realized.—Business Wk, June 24, p30

Fly-Ash Concrete Mix

By substituting fly ash for about 30% of the usual cement requirement in the concrete being placed in Hungry Horse Dam, Montana, a saving of over $1½ million is being realized. The amount of mixing water required to produce a concrete mix having a given degree of workability is slightly less for a combination of fly ash and cement than for straight portland cement.

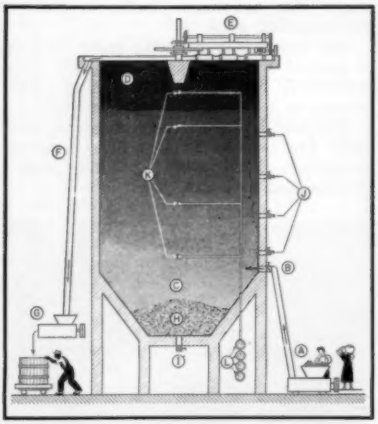
Strengths are lower at 7 to 28 days, but at 1 year the strength of the fly-ash mix equals that of a portland-cement mix. Fly-ash concrete is less permeable and produces a lower heat of hydration. Drying shrinkage is generally less than for a portland-cement concrete.—Eng News-Rec, June 22, p39

Perfect Molten-Metal Dyeing

Molten metal fixes color in Standfast Dyers & Printers Ltd.'s vat-dyeing process (See McG-H Digest, Nov '47, p52). Principle is simple. Cloth is impregnated with dye liquor. Then it passes through the metal bath where dyeing is completed and set. System uses metal-dyeing machine and a conventional soaping range. Cloth passes continuously from bath to soaper.

Dyeing takes place in the molten-metal bath. Exhausted dye liquor is exhausted in a bath similar to the dyebath but containing a glauber-salt solution.

Metal is Wood's metal—an alloy of bismuth, cadmium, tin, and lead. Mercury was first used, but health hazards were great. Wood's metal has a slightly



WINE MADE CONTINUOUSLY

New Argentine continuous process makes better wine with less space and labor needed than with the batch method. Wine is drawn off this 30-ft. high fermenting tower periodically. Crushed grapes A are pumped into tower through pipe B. As juice C ferments, CO_2 gas buoys skins D to top where plows E push them to chute F that feeds press G. Seeds H are discharged at outlet I. Wine is drawn off at outlets J. Thermometers K are read on dials L.—Food Ind, July, p52

higher melting point, 71° C., but no health hazard is present. Functions of the metal are: (1) to exert even pressure on cloth; (2) exclude air; (3) serve as heat source in contact with cloth.

Full fixation, fastness, and increased penetration are obtained in a matter of seconds.

Maximum range speed is 120 yd. per min. Over 6-million yd. of cloth have been processed by the system, one machine having processed 45,000 yd. of cloth in an 11-hr. day.—Textile World, June, p94

Plastic Floor Covering

Oxychloride, or "Plastinail", is a smooth, durable, and fire-resistant plastic, which has been applied to floors of several box cars of the Western Pacific line. After 11 months service, inspection of a test car revealed that the floor was in excellent condition. The car had been subjected to heavy loads, including rough equipment. Loading and unloading had been done with fork-lift trucks.

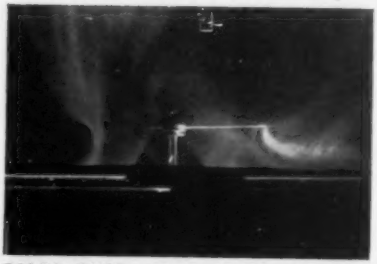
Maintenance and time out of service are held to a minimum because of long wearing qualities of the plastic. The smooth surface simplifies cleaning. Cost of ordinary surface repairs has proved low. The plastic is applied over a layer of wire bond and troweled to any desired finish.—Railway Age, June 17, p57

Calcium Carbide in Cupola

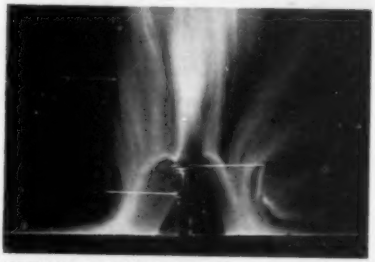
Study of basic-lined cupolas at American Cast Iron Pipe Co. showed value of calcium carbide in the coke bed. Carbide additions increased sulphur removal, carbon pickup, and temperature and decreased oxidation elements.

Adding 6% carbide, for example, produced 0.016% sulphur from a 0.134% sulphur all-scrap charge. Heat-producing ability of carbide permits coke reduction to one-third normal with same melting temperature and 40% greater output. —Foundry, June, p156

Helicopter Rotor Geometry



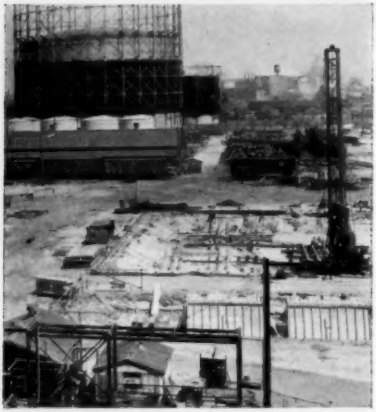
BALSA DUST and floodlights define flow pattern around rotor in presence of simulated ground 25% of rotor dia. below rotor plane. Flow visualization. . . .

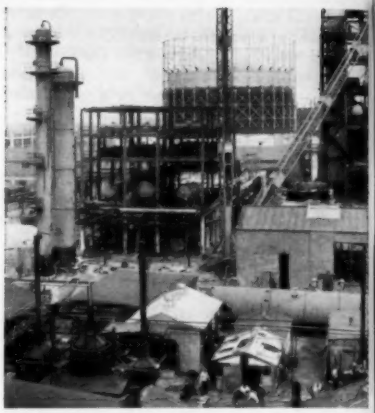


METHOD SHOWS static thrust geometry of rotor wake and trailing vortices from blade tips of coaxial rotor. Balsa particles show . . .

FLOW GEOMETRY resulting from rapid thrust increase of coaxial rotor.—Aviation Wk, July 3, p25

Progress Report for New Construction





***FOUNDATIONS** are poured (left) in photographic progress report on refinery construction. Plant facilities (right) are growing up. Photo shows some steelwork and rigging equipment.*

Photography Aids Oil Refining

The camera can be a useful tool in the oil-refining industry in both construction and operation. Here is how one company puts it to work

PHOTOGRAPHY SAVED time and money when Sinclair Refining Co. built its East Chicago refinery. Jobs too were done that no other method could do.

One use was to make a step-by-step permanent record of construction progress. Pictures were taken at regular intervals, usually weekly. The photographic record comprised nearly a thousand pictures.

They traced the construction of new catalytic cracking unit, crude still, straightrun fractionation and treating facilities, high-pressure polymerization unit, lube-refining units, and boiler-house extension.

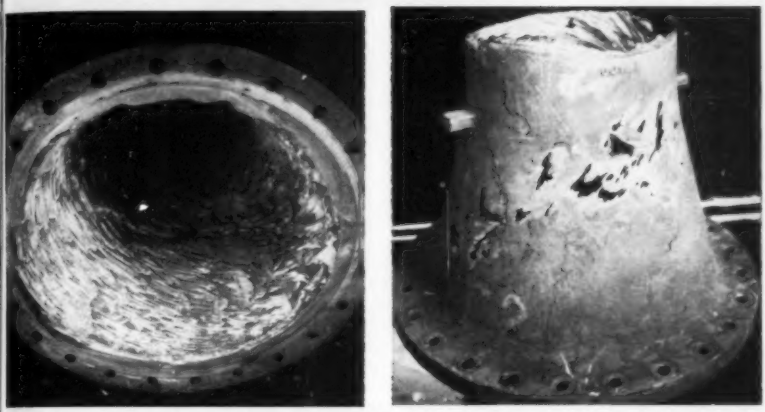
The pictorial record greatly reduced the descriptive material that had to be written for progress reports, and it provided a clearer description than would a long report.

A closely related use in general refinery operation is in analyzing best possibilities for rearranging or relocating overhead pipe lines carrying steam, air, and refinery gases.

Alterations in the piping systems in the old section of the refinery were not always accompanied by changes in the engineering drawings. So photographs of the piping, used with the drawings, simplified the planning of new piping installations.

Sinclair's inspection department also makes extensive use of photography. The camera records equipment failures and

Permanent Records on Erosion Failures



INTERIOR VIEW (left) and exterior view (right) of 4-ft. long cyclone section weighing several hundred pounds afford permanent record of the erosion failures. Sampling would be impossible.

wear and erosion conditions. Former practice when an unusual failure or erosion condition showed up was to cut out and save a section of the piece for study.

Such sampling was limited. But photography has replaced sampling. It provides a more complete record, and copies are readily sent to equipment suppliers if complaints have to be made about quality of product.

The safety department has found photographs valuable for accident reports. They show actual conditions under which an accident occurred, such as hazardous circumstances, presence or absence of warning signs, and availability of safety equipment.

Pictures, for example, were taken of an oil scum found on the surface of a shipping canal adjacent to the refinery boundaries. Later they established that the refinery was not responsible for the contamination.

Another type of work carried on by the photographic department is photomicrography. Micrographs help regularly to control operations on stills making paraffin distillate.

Stills are run to get maximum yield of distillate with proper wax characteristics. Too deep a cut into the stock causes microcrystalline wax to appear in the distillate, interfering with normal wax-finishing operations. Therefore, distillate samples are photographed daily to determine crystalline structure of the wax present.

Micrographs also are used to record results of bearing tests on heavy-duty lube oils and greases. They give infinitely more information on the amount of wear and scoring of the test bearing than would extensive descriptions.

Other occasional uses for photomicrography include checking of particle sizes of abrasives and of catalysts for the catalytic cracker. Metallographic studies of ruptured or broken parts help determine the cause of failure.—Oil & Gas J, July 6, p40

How to Analyze Equipment for Power Transmission

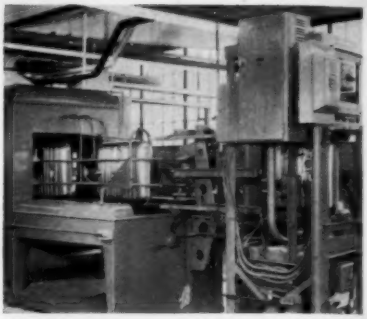
Machines and motors are no better than the drive equipment that connects them. That is why the load to be driven must be analyzed before selecting the power-transmission equipment—flat belts, V-belts, chains, gears, flexible couplings, or other devices. First get the answers to these questions, then select the drive to fit the answers:

1. Does the machine develop a rapidly fluctuating load?
2. Is the load fluctuation regular or irregular?
3. Does the machine develop a gradually increasing load?
4. Of what time duration are the peak loads?
5. Does the machine develop a shock load?
6. Are the shocks frequent or occasional?
7. May the machine, at a later date, be required to do heavier work?
8. Is the machine subject to unexpected load increases?
9. Does the unit contain heavy moving parts having considerable inertia to overcome in starting?
10. Does the machine perform work while being started?
11. Is the machine started often?
12. Is the drive subject to braking or reversing service?
13. Should drive protect machine from overload?—Power, June, p118

Control-Gate Maintenance

Cleaning the 28 intake control gates of a St. Lawrence River power station was an example of how modern methods can speedup maintenance work. The steel gates, each one 24 x 32 ft. by 30 in. thick, were badly rusted.

Gates were first washed, scraped, and brushed. Then they were cleaned with oxyacetylene flame, which heated scale and popped it off. Immediately after flame priming, gates were painted. The heat in the steel gave a low-temperature baking to the paint and increased its durability.—Weld Eng, June, p54



SPOTWELDING GAS TANKS

At the Oldsmobile Lansing plant, automobile gasoline tank halves move through the washing cycle standing on edge. Halves emerge from washer at left and are brought together by guide bars as they move onto the conveyor tack welder. Welded tanks move toward the right and drop flat on a roller skate conveyor leading to the seam welder. —Iron Age, May 25, p82

One-Fired Tile Glazing

Revolutionary process for applying glaze to tile is applicable to any color or texture and produces tile at a cost less than half that for hand-decorated tile. Process, owned by Cerametal Corp., may be applied with equal success to dinnerware, terra-cotta, glass, and porcelain enamel surfaces.

It permits superimposing of one or more glazes on another on the tile body, which carries a predetermined pattern. One firing then matures the entire design with the colors in arrangement and number determined by glazes. Colors do not blur. Success of process depends on composition and mixing of glazes.—Ceramic Ind, July, p86

Rating Form Saves Time in Machine Replacement

Determining machine-tool replacement is a requirement for keeping a shop up to date and able to compete. The Morgan Construction Co., builder of rolling-mill machinery, has adopted a machine-tool analysis, review, and replacement program that is especially suitable for medium-size plants.

One-half of the equipment is rated each year by five persons. This takes only a day or two for each man. Their findings are reviewed against the needs of the business as a whole by the vice-president in charge of operations.

Rating is done on an 8½x11-in. form that lists information about the machine and a classification chart. Five factors are rated: utilization, accuracy, condition, age, and abuse. Rater's opinion is checked in the three to five boxes provided. Arbitrary values have been assigned to the rating degrees on the basis of 20year machine life.

OPERATION FROST BITE

Day-old chickens can be kept comfortable at temperatures as low as —120° F. This was proved by an experiment of Delaware Power & Light Co. Thirty chicks were placed in a freezer room of cold-storage plant. Heat was supplied by four 250-w. infrared lamps. Chicks at end of 2 wk. weighed slightly more than others raised under normal conditions.—Elec World, July 3, p118

An average of opinions gives the final rating, which is entered on a master record. This then is followed by assembly of a replacement list from (1) obsolete machines, (2) new machines that should be included, and (3) "bottle-neck" machines.—Am Mach, June 26, p76

Better Crating, Less Damage

The carrier is not always to blame for customers' reports of "damage in transit". It is possible that their product packaging is not designed to do an efficient job. Tests have been performed by the National Safe Transit Committee, Washington, D. C., using an electric shock recorder attached to a conventionally crated product. Results indicate that handling, not the method of transport, does most of the damage. A package may suffer about as much in gentle transportation like air freight as in rough movement like rail freight.

The committee has suggested a compromise between improved crate design and product design with respect to packaging as the means for reducing transit damage.—Business Week, June 24, p43

More Sensitive Phototube

Significant improvement has been announced by Radio Corp. of America in type 1P21 photomultiplier tube. Equivalent noise input has been reduced sixfold. This permits a lower limit of measurable light intensities.

Typical application of new method in atomic research is in a light-piping technique to measure radiation generated by a cyclotron. The test instrument need not be in the cyclotron.

A long light-conducting plastic rod with a phosphor on its end is inserted in the cyclotron. Flashes of light produced when radioactive particles strike the phosphor are piped to the phototube located outside the cyclotron. Thus, the radioactivity can be measured.—Electronics, July, p166

CONTROLS PRESS

Control system automatically maintains coordination of colors in multi-cylinder printing presses. First cylinder prints reference mark on paper. Photocell scanning mark sends signal to amplifier, which also gets signal from impulse switches. If signals are out of phase, compensating roller corrects coordination. Maker is Electric Eye Equipment Co.—Prod Eng, July, p94

Choosing Power for Plating Depends on Application

Decision to be made in selecting a power source for electroplating is whether to use a rectifier or a motor-generator. Depending on the application, rectifiers may be more economical.

Lower initial cost is largest single factor in favor of rectifiers for the lower ampere ratings. Rectifiers will take short-time overloads, but continuing overloads are better handled by an m-g. unit. Voltage regulation, important to control-current density, is relatively poor with rectifiers, while variable loads are a natural application for an m-g.

Efficiency depends on two variable factors: load applied and ambient conditions. It is best evaluated at high kilowatt outputs and depends on the age of a rectifier. The m-g. set has by contrast a definite lifetime efficiency and is best suited for high power ratings.

The rectifier does not correct power factor to compensate for inductive-type loads such as are present in most plants. The many buffing and polishing machines usually operate below rated load and with a poor power factor.

Installation costs are low for rectifiers because no base is required. They are also lighter as less steel and copper are used, but they do not have the margin of safety in overload ability that m-g. sets do.—Am Mach, June 12, p90

Metal Powder Developments

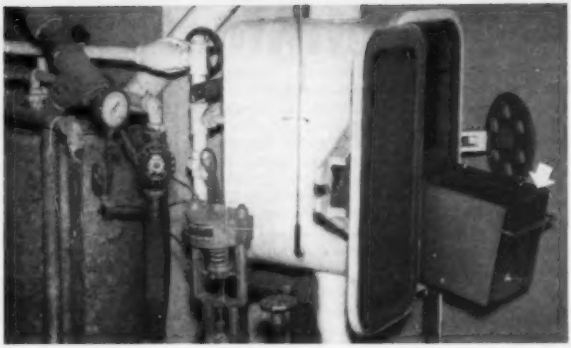
Powdered metals until recently have been limited to oiless bearings and cemented-carbide parts. At a meeting of the Metal Powder Assn., technical papers pointed up progress in die design, press design, and powder developments.

New applications of powdered metals include: bearings, bearing parts, odd-shaped gears, clutches, ratchets, and cams.

Special applications: Copper combined with steel so the copper will melt when the steel is shaped to produce a self-brazing part; lead dispersed in copper to provide bearing properties.

Combination of powders: Copper combined with carbon for brushes—the copper provides conductivity, the carbon antifriction properties; silver combined with tungsten resists heat and wear; and mixtures of copper, tin, iron. lead, graphite, and silica to produce heavy-duty friction surfaces.—Business Wk, July 1, p38

DRIES FRUITS



Nuggets of soft, puffed fruits that retain natural color and have less than 2% moisture are made in this pilot evaporator. Water is evaporated by hot (220° F.) vegetable oil in receptacle (arrow) that slides into vacuum chamber. Products include puffed banana slices, seedless grapes, prunes, and apple slices. Process is in use at Vacuum Cooling Co., Calif.—Food Ind, July, p71

How to Cut Processing Costs with 14 Practical Methods

Cost reduction in processing plants can be made to work. Here are 14 tips that will help if applied intelligently:

1. Make a material balance—then you will know what you are using and where.
2. Check operating standards by comparison with other plants' data.
3. Check process efficiency in terms of throughput for a given piece of equipment.
4. Cut careless waste with proper and sufficient instrumentation.
5. Set up equipment operating records in writing—for both cleanout intervals and replacement.
6. Plot operating data graphically to spot unknown correlations in processes.
7. Eliminate wasteful sampling by control units—a pint three times a day is a half ton a year.
8. Consider making solutions more concentrated to save handling and storage.
9. Recheck past employee suggestions.
10. Make a time study of plant operators.
11. Get maximum work from all research and pilot-plant equipment.
12. Improve safety practices.
13. Prepare loss reports for materials lost in processing—this will help stop dumping bad batches.
14. Write up modern operating procedures for operators.—Chem Eng, July, p126

Carbide Mills Hard Steel

Repairing hardened steel dies of 62 Rockwell C hardness is routine for Parson's Tool, Inc. No annealing is required, as milling, drilling, boring, and counterboring is done with carbide tools of company design.

End mills have two or three teeth with carbide tips mounted in a heavy cushion of silver solder.

Counterbores have four teeth and a pilot. Each lip is ground with a flat on the end and 14° clearance. Boring tools are essentially a piece of carbide brazed across the end of a shank.

Drills for holes from 0.050 to $\frac{1}{8}$-in. are made from a piece of unsupported carbide. Theory is that carbide properly treated does not require careful support.

In general, water-hardened steel has given more trouble than either oil- or air-hardened steel because of its hard case and soft core.—Am Mach, June 12, p94

Technical Shorts

Motor Reverses Quickly—A method of reversing small electric motor in 3 to 4 millisecs. has been developed by U. S. National Bureau of Standards. Kinetic energy of rotor, instead of being dissipated as heat in a brake during deceleration, is converted into potential energy in a torsion bar. Stored energy then accelerates the rotor rapidly in opposite direction.—Auto Ind, July 1, p45

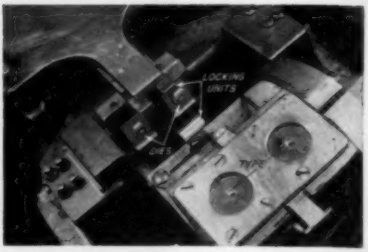
How to Sell Stock—Colombia has a novel way to raise money for its planned government-sponsored steel mill. A special tax is added to regular income tax to finance it. But the tax need not be paid by anyone who has invested an equal amount in steel company stock. So the stock is selling nicely.—Iron Age, June 15, p11

Turbine-Blade Material—U. S. National Advisory Committee for Aeronautics is developing ceremals—a combination of metals and ceramics for gas-turbine blades. Ceremals can operate white-hot one instant and cold the next without cracking or warping.—Business Wk, July 8, p30

Electronic Safety—Smoke detection and exhaust system at Sage-Allen store in Hartford, Conn., prevents smoke and fumes from spreading throughout the store. Photocell on detecting smoke turns off escalators, sounds alarm, opens exhaust ducts, switches on exhaust fan.—Elec C&M, June, p82

Well Lighted Stairwell—Continuous fluorescent lamps extending vertically from basement to roof light stairwell at Line Material Co.'s new office building. They are supported only at the ends and are controlled by remote auxiliaries.—Eng News-Rec, June 22, p30

Cutting Torch Saves Gas—New British torch operates on unusual design principle. When metal is cut, heat is released. Torch puts this secondary heat to work by reducing flow of gases. Savings are claimed to range up to 65%.—Weld Eng, July, p30



KNEEDING DIES MAKE TYPE

Individual pieces of type steel are brought under pressure against dies that rock through an angle of 20° about a point in the center of the die face. Two slugs of type are placed in fixtures held in a four-position indexing turret. Picture shows kneading dies below spring-mounted locking unit. This unit acts with that on turret to lock and release type in fixture as turret advances and returns. —Am Mach, June 12, p85

Smoother Control Surfaces—Aircraft control surfaces completely free of wrinkles are made by riveting 0.016- to 0.20-in. sheets together to form one large sheet. Small areas are then progressively heated to 150° F. while both lateral and spanwise tensions are maintained on sheet.—Prod Eng, July, p5

Prints Fine Pictures—Smooth uniform finish on paper depends on molding quality of the sheet and is necessary for satisfactory printing of halftones. Such a finish permits close contact between paper and printing plate. Under special conditions, 400-line screens are being printed.—Paper Ind, June, p319

Power Use Jumps—Electric-power consumption in British Columbia, Canada, has increased 2½ times in 10 yr., making it a fertile business field. To meet the demand has meant a $30-million expenditure on generating capacity. Large part of power load came after the war.—Power, June, p206

Use Similar-length Fibers—Spinning of short-fiber stock cannot be improved by mixing in small quantities of long-fiber materials, according to Swedish investigations. By mixing fibers of different lengths, different Fibrograms were produced that proved yarn production is facilitated by using together fibers of similar length. Different-length fibers run together hindered good running of the yarn.—Textile World, July, p270

Air Blasts Vibration—Routing door and window openings in a "sandwich" of stainless steel, plywood, and aluminum for railroad-car body created serious vibration because of tough materials clogging router teeth. An air blast blew out the chips and stopped the vibration.—Am Mach, June 26, p121

Graphite and Water—Boiler inspection is easier if handhole-plate assemblies are sealed with graphite and water, not graphite and oil. Oil bakes to carbon and freezes on nuts and gaskets. Water does not cause this trouble, yet the graphite seal is good.—Oper Eng, June, p29

Sonics Grade Grinding Wheels—Sonic testing of grinding wheels at Carborundum Co. involves rapid measurement of frequency of resonant vibration. As a stylus vibrates a wheel to its resonance pattern as shown by an oscilloscope, frequency is read from generator meter, thus giving a comparison of hardness.—Steel, June 26, p74

Automatic Inspection—Grease fittings can be inspected using air pressure to test for clear opening through fitting. If hole is clogged, pressure will build up automatically, rejecting the part. Formerly, fittings were inspected by pushing a pin through opening.—Factory, July, p106

Maintenance—Money spent on maintenance is an investment for longer machine life and insurance against delays and breakdown. Preventive maintenance is necessary to insure full production at maximum efficiency. Experience and good judgment are deciding factors in determining when maintenance is no longer profitable and old machine must be replaced.—Cons Meth & Equip, July, p88

Strong Zinc Alloy—General Electric Research Laboratory has made a zinc alloy as strong as brass by small additions of copper and beryllium. It is designated "Zncube" (pronounced zin-cue-be) from chemical symbols of alloying metals.—Foundry, June, p156

Guards Water Purity—Sparkletts Drinking Water Corp. has installed germicidal lamps to safeguard the purity of artesian spring-water as it is being bottled. Bottle line from sterilizer to sealing machine and even the water sterilizer are exposed to lamp radiation.—Elec World, June 5, p126

More Propane Buses—Pres. Fageol of Twin Coach Co. predicts that 20% of U. S. urban buses will use propane by 1952. Leading bus lines are interested in conversion. Big advantage is that exhaust is colorless and odorless.—Chem Eng, July, p80

Reduces Fire Hazards—Flushing out oil-tanker loading lines with carbon dioxide at Magnolia Petroleum Co.'s Gulf Coast docks is making the job safer. Purging is done on all lines handling crude oil, kerosene, and lighter products. Other safety measures are use of spark-proof tools and spark-proof alloy flanges on loading hoses.—Oil & Gas J, June 29, p68

GRINDS THREAD-ROLLING DIES

Fruit-jar caps are threaded with ring dies whose thread forms must match position with a keyway. At Sheffield Corp., form is crush-dressed on grinding wheel by steel ring. Arbor position is synchronized with wheel by matching pilot ring at left of blank with grooves. Slide is shifted, and die is ground as arbor revolves once while it traverses one pitch.—Am Mach, June 26, p78

Electric Welding Advances

Leading welding engineers hear how to stabilize inert-gas arcs, something about moving-coil transformers, how to weld glass

ELECTRIC WELDING CONFERENCE recently held in Detroit and sponsored by the American Institute of Electrical Engineers covered virtually everything new in the field. Here are a few of the more novel, interesting subjects:

New electrodes for stabilizing inert-gas welding arcs were discussed by General Electric engineers. Slow starts with cold tungsten electrodes may lead to irregularities in welding. Using electrodes other than pure tungsten does away with this trouble.

The new electrodes are intended primarily for straight-polarity welding. One is a pure tungsten rod coated with either zirconia or thoria and a suitable binder. The other is a mixture of tungsten and thoria powder extruded into rods and sintered.

Presence of the refractory oxide—zirconia or thoria—makes possible a stable spot. On application of voltage, arc immediately establishes on the electrode tip.

Reported by the Miller Electric Mfg. Co. was its return to the moving-coil type of welding transformer and its effort to do away with the ordinary limitation of slow current adjustment. The solution was to use a totally enclosed oil hydraulic system, driven by a ½-hp. reversing motor.

To avoid starts and stops, the motor is kept running but is bypassed until the operator presses a button to move coil up or down. Coil travel halts instantly at the desired current level. Although this control is not inexpensive, it is claimed to offer excellent welding characteristics.

Welding of hard, heat resisting borosilicate glasses was another topic of current interest because of the intricate shapes, such as television tubes, demanded by modern industry. Such shapes cannot be blown, but must be produced by joining of component parts.

Electric welding methods include dielectric loss heating, induction heating, and resistance heating. The last method has been found to be most practical.

Electrical resistivity of glass decreases rapidly as its temperature rises until at 500°–1000° C. glass can be heated electrically. To bring the joint to the required elevated range, the starting-coat method is sometimes employed.

A semiconductive coating such as graphite is painted on the glass, and gaps are scratched in the coating with a stylus. As current is applied, small arcs form across the gaps. Resulting heat

FREE SLUICE GATE OF DEBRIS

Two hydraulic monitors blast sand away from logs and debris lodged against sluice-gate trash racks at a Southern California Edison Co. reservoir. Clogging materials can then be easily removed by hoist. Monitors use penstock water at 220-psi. pressure and 21-cfs. flow. Stream is 5 in. in dia. with 3-ton impact.—Elec World, June 19, p126

burns the coating away and enlarges gaps, thus creating still more heat to raise the temperature to the required range.

Another preheating method heats the glass by oxyhydrogen flames. The glass object is revolved in a lathe above the heating head. When the glass reaches dull-red heat, the welding current is passed through it, with the oxyhydrogen flames acting as brushes.—Weld Eng, June, p36

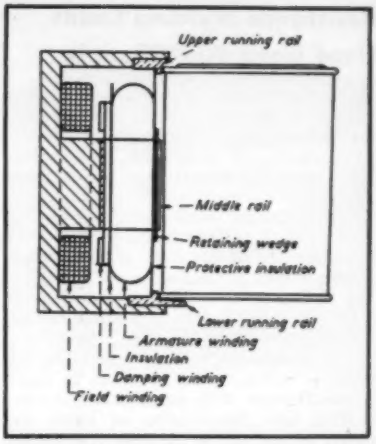
Adhesive Development Saves Time and Money

Metlbond, developed by Consolidated Vultee Corp., is believed to be the only adhesive used in the U. S. to join metal parts over large areas. Continuing laboratory investigations are expected to result in refinements that will make it more usable and economical.

The process is comparitively simple. Surfaces to be joined are cleaned with a solvent, then sprayed with a thin film of cement. This is air dried for a short time, after which adhesive in film form is placed on the surfaces to be joined. Pressure and heat are then applied to the areas in contact to complete the bond.

To date, Metlbond has been used primarily on clad aluminum alloy and on magnesium alloy. It is applicable also to ferrous and to other non-ferrous metals, but processing methods for these have not been fully investigated.

A significant advantage of Metlbond over most of the other high-strength metal adhesives is that it is more adaptable to production use. Ordinary solvent cleaners have been found satisfactory. Application in dry film form leads to simplification. Curing temperatures and pressures are relatively simple to maintain. Bonds can be made at pressures below atmosphere permitting tooling simplification.—Aviation Wk, June 19, p20



CANS ARE CONVEYED by electromagnetic force along a vertical track on this . . .

Electromagnetic Conveyor

Electromagnetic can conveyor is a British experimental development. Its purpose is to aid handling of empty cans during manufacture and to convey them to the filling department without damage to their enameled surfaces.

The conveyor is an elongated electromagnet with a vertically placed track to which the cans stick upright. Cans roll along the track on their rims.

The track consists of two outer running rails and a middle rail. All three rails constitute poles of the electromagnet. Cans are propelled by traveling waves of magnetic force that are induced in the middle rail. Can speed depends on wave speed.

The conveyor is energized by dc. The field winding provides the mmf. to keep cans on the track while the armature winding concentrates the mmf. along the middle rail at points made to travel by brushgear revolving around commutator. —Mach, June 24, p943

Resistance Welding Loads Need Good Power Supply

To get full benefits from resistance welding as far as power supply is concerned, the manufacturer should:

1. Estimate magnitude, power factor, and characteristic of the welding load.
2. Estimate equivalent continuous thermal load, or heating effect, of welder. It equals kva. demand times square root of the duty cycle.
3. Determine voltage regulation required at all points in plant distribution system to avoid interference.
4. Determine voltage regulation the power company wants so as to avoid interference with neighbors.

With this information at hand, the power supply can be planned. The feeder type and size depends on welding load, permissible voltage drop, thermal load, equipment location, plant operating practice, and cost. Single conductor cables in conduit, concentric cable, or low-reactance bus work well with multiple-transformer welding presses.

Welding transformers are often connected to give a balanced 3-phase load. Single-phase transformers are arranged in three groups and each group is connected to a different phase. The reduced kva. demand per phase results in less voltage drop in feeder and supply transformer.

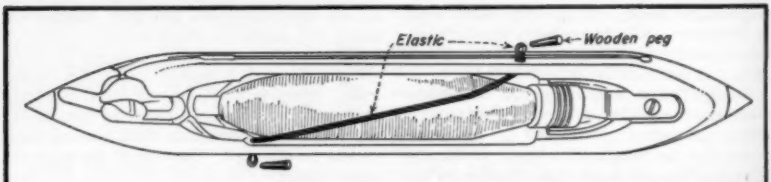
Greatest reduction in kva. demand for multi-transformer welding comes from power-factor correction. One way is to locate transformers so secondary cable spacing gives the least possible inductive reactance. Other ways: shunt capacitors and series capacitors for power-factor correction.—Power, June, p94

Drills Shot Holes with Air

Dry drilling of shot holes in oil exploration circulates a stream of air through the drill pipe, instead of mud as in conventional drilling. If tests now underway prove successful, portable air compressors may take the place of water trucks.

Blind holes do not present the problem they do in water drilling because air is available in unlimited quantities. Another advantage is the increased drilling speed. More weight can be kept on the bits, and faster bits can be employed.

Bits also last longer. No part of the cuttings is recirculated, so sand and grit are kept out of bearings. With stiffer drill pipe, the bit is kept solidly on the bottom of the hole. Chattering and bouncing of the bit are stopped.—Oil & Gas J, June 22, p151



ELASTIC BAND INCREASES YARN TENSION

Some filling yarns require more control over tension in the shuttle than can be obtained with fur or with fur and bristles. Good results have been obtained with a band of elastic pegged diagonally across the inside of the shuttle. Holes are drilled through the shuttle wall as shown. One end of narrow elastic band is inserted through each hole. Small wooden pegs are pushed into holes flush with the shuttle wall to keep the elastic band in place. The elastic tension should be adjusted first.—Textile World, July p163

MODERN LIGHTING AIDS WORK AND SALES

Luminous ceiling in reception room is formed of plastic sheets supported on wood louvers. Fluorescent lamps installed 3 ft. above the sheets light the panels evenly and give 50 ft.-c. below.

Louverall lighting with plastic louvers provides diffuse 60-ft.-c. illumination in automobile salesroom. Incandescent 200-watt lights in circular element add sparkle to car bodies.—Elec C&M, July, p90

Plated Phosphorus Alloys Promise Commercial Use

Electrodeposits of cobalt or nickel alloyed with as much as 15% phosphorus are possible with a method developed by U. S. National Bureau of Standards. The phosphorus alloys are hard, corrosion-resistant, bright, and said to be more easily deposited than chromium.

Indicated uses include: gages, cylinder walls, piston rings, and other machine parts where wear resistance is required.

Plating baths consist of nickel or cobalt salts to which phosphorus acid is added. Bath pH is between 0.5-1.5. Solution must be buffered; phosphoric acid works well. Bath temperature is 75° C. or more. Current density is 5-40 amp. per sq. cm.

Appearance of deposits depends on phosphorus content. Alloys with less than 2% are usually smooth with a matte finish. As phosphorus increases, brightness increases to a peak at 10% phosphorus.

Deposit hardness as plated varies from 350 to 720 Vickers, increasing with phosphorus content. Heat treating increases hardness.—Steel, June 19, p99

New Mill in West Indies

Machinery for a new cotton spinning, weaving, dyeing, and finishing plant was recently purchased in North Carolina for setting up in Ciudad Trujillo, Dominican Republic. It will be the second large-scale textile mill using locally grown cotton to be erected in the country in less than a year. Under the terms of a recently enacted law providing franchises to new industries using domestic raw materials, the new plant will be exempted from the payment of all taxes on the operation of the unit.—Textile World, July, p272

How Poor Operation Ruins Refrigeration Equipment

Operating engineers can find many ways to add to normal wear and tear of refrigerating equipment. Here are the most common of these bad practices:

1. Using wrong lube oil or leaving contaminated oil in system too long.
2. Forgetting to clean filters.
3. Not filtering dirty blowdown oil before recharging.
4. Charging oil with a dirty can.
5. Neglecting to grease bearings.
6. Using woolen wicks for capillary feed lubricators.
7. Not purging the system of air and other non-condensable gases.
8. Starting compressor against closed discharge valve.
9. Neglecting to defrost evaporator.
10. Not repairing leaks.
11. Using wrong V-belt tension.
12. Running with dirty motors.
13. Having too few instruments working properly.
14. Not cleaning condenser tubes.
15. Using a pipe wrench on expansion-valve rim.—Oper Eng, July, p36

Engine Road-Test Simulated

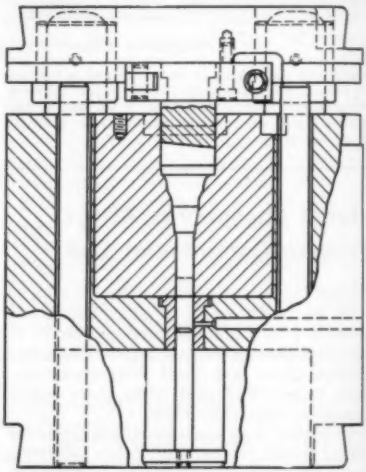
Best techniques for determining motor-fuel octane rating requires actual road conditions. Laboratory stop-and-go city driving can be simulated by a dynamometer control device employing a closed servo system.

This system, designed by the Shell Development Co., uses a speed sensitive tachometer generator, crankshaft driven, to provide a velocity signal and its first derivative (acceleration) to a control unit. A third error channel provides a high-order derivative signal to counteract slow response. These signals drive the amplifier to supply dynamometer field current, which regulates test-engine speed.

Unique high-power amplifier has twelve type 807 tubes in parallel. Speed-VS-time diagrams are automatically plotted by an Esterline-Angus recording millammeter. Adjustments allow for different body styles and engines.—Electronics, June, p96

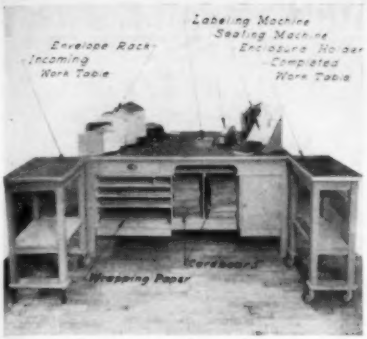
Reduces Mine Roof Spalling

Red Jacket Coal Co. is applying four coats of liquid plastic to 6,000 sq. ft. of mine roof to reduce spalling caused by temperature change. The plastic is nonflammable, dries quickly, is easily applied. Roof must be scaled, brushed, and blown to remove loose particles before plastic is applied.—Coal Age, June, p102



EXTRUDES AXLE SPINDLES

Spindle forgings for automobile front wheels are extruded by Ford Motor Co. A single-cavity extrusion die takes the place of standard open die. Extrusion is done on a 1,750-ton Maxipress. The die has a tapered hole at the bottom. Hot metal is forced first into upper part, then into central hole to form tapered spindle on the forging. Results: 30% less scrap, lower die cost, labor saving.—Iron Age, June 15, p108



WORKING ARRANGEMENT Permits . . .

Unitized Paper Work

All office work calls for some combination of desk, chair, table, raw materials, machines, and small tools. Coordinate these with the operator in a convenient group, and a practical example of unitization results.

Illustrated is a working arrangement in the U. S. Government Printing office. The revised desk facilitates servicing orders for publications. Incoming work table is used for collecting from stock articles ordered and for delivery to the assembly desk. At this desk the articles are checked against the order, are placed with enclosures in an envelope or are wrapped, and address label is affixed. Outgoing table is used for delivery of processed articles to proper station.—Am Business, June, p15

Coke-Oven Refractories

Coke-oven brick must be of highest possible quality, and initial cost is of minor importance compared to length of service. Average life of an oven is 20 years, and overhead costs are reduced considerably with proper refractory.

Silica brick has great resistance to load and abrasion at high temperatures. It is immune to carbon disintegration and practically spall-proof above 1200° F. Chief disadvantage is rapid, reversible, thermal expansion between 390°–530° F. because of inversion range of the high cristobalite content.

They do not vitrify or shrink, but expand very slightly. An unusual feature is that they are most sensitive of all refractories to thermal shock below 1200° F. and least sensitive to same shock above that temp.

Standard fire-clay bricks have relatively poor resistance to vitrification, shrinkage, load, and abrasion above 2300° F. They have high resistance to thermal shock below red heat.

Yough, a special spall-resistant silica brick, is used for the crowns of beehive ovens. A special burning schedule and high silica rock are responsible for these properties.—Steel, May 29, p64; June 5, p98

100-Million Photos per Sec.

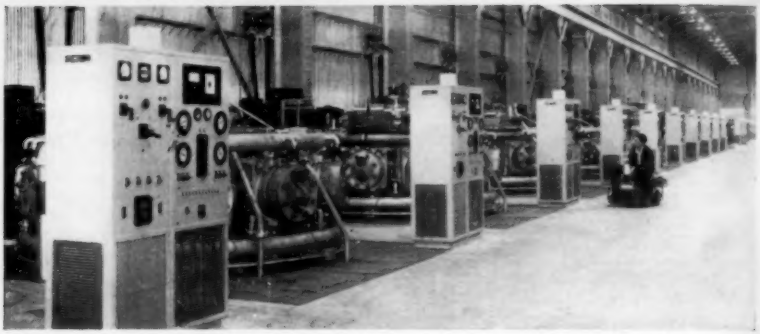
Device for making 100-million photographs per sec. has been developed at U. S. Army Aberdeen Proving Ground. The Army is using it to record shock and detonation waves in studying explosives in shaped charges.

The terrific speed is made possible by a framing grid and rotating mirror. The grid is a focal plane shutter consisting of a series of parallel slits through an opaque plate. Slit width determines exposure time, and the ratio of space width to slit width determines number of successive frames.

The mirror sweeps a full-size image of the grid across a 4x 5-in. film plate. The total distance the image moves to expose the entire film is only one space width.

To obtain a detonation record, a first image is formed on the grid and the the image combination moved across the film by the mirror. Resulting picture is viewed through the grid.—Prod Eng, July, p145

Unusual Spark-Ignition Engines Yield . . .



Cheap Power for Alcoa Plant

Low-cost power is essential for economical aluminum production so cheap natural gas and radial gas engines combine to make cheap power

TO MAKE 1 LB. of aluminum takes 10 kw.-hr. of d-c. electricity. Thus, economical production depends on low-cost power.

First plant built 62 years ago by Aluminum Co. of America used gas as the fuel, but plants built since then have been operated by hydropower. The swing is now complete with a new gas-engine plant at Point Comfort, Texas.

The plant—the world's largest gas-engine plant—has three power houses. Each contains 40 Norberg radial spark-ignition engines rated at 1,900 hp. each at 400 rpm. Engines are built for oil-diesel, dual-fuel, or gas operation. At Point Comfort, they operate on natural gas because of cost and availability.

A generator is mounted vertically beneath each engine. The crankshaft is vertical, with crank above and generator below in cool zone. Eleven cylinders bolt radially to the main-frame casting. Pistons are aluminum alloy. The design of the connecting rod assembly eliminates the master connecting rod usual in radial engines (McG-H Digest, Sept '48, p38).

The radial design offers these advantages: (1) compact, lightweight unit, (2) full counterweighting, virtually eliminating vibration, and (3) easy installation.

Engines at Point Comfort run at 360 rpm., making net output of 1,000 kw. Consumption of 910-Btu. gas is 11.4 cu. ft. per gross kw.-hr. or 12.42 per net kw.-hr. This equals 29-30% efficiency.

Out of 40 engines in each power house, 35 normally feed the pot line, leaving 5 for standby and scheduled outage.

Each set has its own protective gear for automatic shut-down in case of failure. In fact, the 120-engine plant has been made as nearly automatic as possible. Each power house needs only three men per shift. Even making the regular inspection rounds has been made as easy as possible by supplying a rubber-tired battery-powered scooter.—Power, July, p76

Coil Insulation Offers Good Electrical Properties

New synthetic-resin-bonded coil insulation promises increased reliability for large high-voltage steam-turbine generators. The insulation, called Thermalastic, was developed by Westinghouse Electric Corp.

It is based on mica but has an elastic, thermoset synthetic resin substituted for asphalt or shellac bonds. Characteristics include low power factor, high dielectric strength, good voltage and thermal endurance, improved moisture and oil resistance, and increased tensile strength.

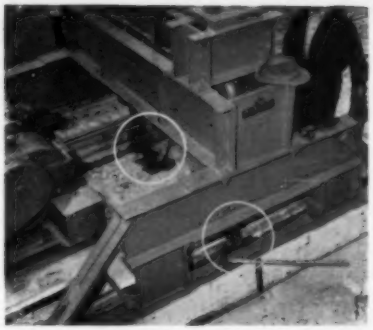
Thermalastic has been adopted as standard for stator windings employing half-coil construction on Westinghouse 12,500-kva. and larger generators. In making the coils, all strands of each conductor are first insulated individually with fiber glass. The portion of the conductor to be embedded in the slot is bonded solidly.

Coils then are insulated by multiple layers of mica tape, which is covered with fiber glass tape. Fully taped coils are heated, vacuum treated, and impregnated with the bonding resin varnish (alkyl-vinyl resin). Resin is cured by oven heating while mobile presses restrain the insulation.

Work is now going on to adapt full coils embodying this new insulation to other types of electrical machines.—Elec World, July 3, p84

One-Coat Hammer Finish

Hammer effect can be given to metal items by spraying a new enamel called Uni-loid. Made by United Lacquer Mfg. Corp., the enamel is available in full color range and in either a bake or an air-dry finish. Baking time at 300° F. is 20 min. in a gas oven or 8 min. under infrared lights. The air-dry enamel can be handled in an hour and dries hard overnight.—Chem Eng, July, p166



JACKS PULL RAILS

Two 125-ton hydraulic jacks are suspended from a steel frame. They have jaws for clamping to rails. A pair of rails may be raised. Small openings—one each side of each rail—are cut into the pavement. Jacks are clamped to rails in the openings. As jacks rise, rails come out of pavement.—Eng News-Rec, June 20, p44

Building Large Gear Blanks

Effective method of building large gear blanks by means of submerged-melt welding was developed by Milwaukee Crane Co. The web is a circle cut from ⅝-in. thick plate, while the rim is a strip of 3-in. wide 1-in. thick plate.

The rim is bent to the O.D. of the web and tack-welded in place. A dike, made of a metal box and carbon blocks, is built around the rim opening. Magnets hold the box to the rim.

A submerged-melt multipass weld across the opening is made at 650 amp. Welding takes 1¼ min. Excess metal is removed with a gouging torch. Next the hub is welded manually to the web. Then the rim is submerged-melt welded to the web on both sides at 15 ipm.

The gear blank is stress-relieved at 1,350° F., and teeth are cut. About 25 different sizes of blanks are made this way.—Weld Eng, July, p21

Drums Lithographed, Lined Before Forming to Shape

Full-size drums are now formed by Rheem Mfg. Co. after color lithography of exteriors and lining of interiors. While this practice is common for small containers, Rheem's installation is the first to handle the 36-lb., 3x6-ft. sheets of 18-gage steel needed for 55-gal. drums.

First step is roller coating, followed by lithography press and bake oven. After the base coat is baked, the sheet is returned to the lithography press. It makes one trip through the press for each color. For lined drums, the sheet is returned through the roller-coater for application of the inner lining before it is lithographed.

The sheet then moves by conveyor through a shot-blast that cleans a 5/16-in. margin along two sides of the sheet. After forming, the drum is seamwelded along the abraded strips.

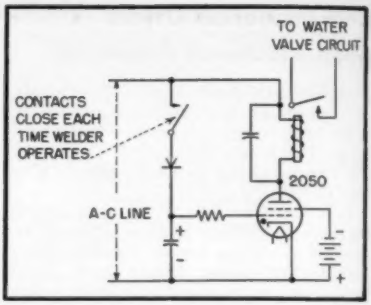
Drum is next flanged at both ends, beaded to form rolling hoops, and assembled with head and bottom by seaming rolls. After the drum passes air testing, the side seam and chimes are spray-coated.

Rheemcote application, as it is known, lends itself to use of oleo resinous coatings as well as vinyls, phenolics, epons, and urea alkyds. Lining thicknesses range from 0.0005 to 0.002 in.—Iron Age, June 15, p99

Wide Speed Ranges with AC

Frequently the best speed for a production machine does not match feasible motor speeds. When only a-c. power is available, you can use:

- A multi-speed motor having two, three or four different fixed speeds.
- An adjustable-speed a-c. motor whose speed can be regulated between certain limits.
- A factory assembled unit consisting of an a-c. motor and a d-c. generator, or rectifiers and d-c. motor and controls. Speed of the d-c. motor can be varied.
- A motor with built-in belt-connected variable-pitch pulleys.
- A motor with built-in gear reduction.
- A motor and variable-speed transmission.—Factory, July, p87



SAVES COOLING WATER

Condensation forming around welding-transformer coils as they cool is a hazard in summer months. So water should be turned off as soon as ignition tubes and transformers have cooled. This takes about 2 min. This circuit does it by grid capacitor. Welding keeps grid charged. When welding stops, capacitor discharges in 2 min., blocks ignition tube, and turns off relay controlling water flow.—Electronics, July, p70

Midget Doughnut Snacks

Consumers are buying small snack doughnuts and, surprisingly, they do not cut down the sale of regular-size doughnuts.

The midget doughnuts are made in a small machine, which can produce up to 3 doz. of the 1¼-in. dia. doughnuts per min. The machine is manufactured by Tom Thumb Donut Corp., Hollywood.

Wet mix is extruded onto a perforated tray submerged in hot frying oil in a spiral porcelain canal. Fat is 390° F. cottonseed oil kept circulating by a pulsator.—Food Ind, June p57

How Terry Towels Are Woven and Finished

Turkish towelling, or terry cloth, is woven in the U. S. on a loom equipped with two warp beams and a specially constructed terry motion. A cam, doby, or jacquard loom may be used. One warp forms the pile loops and the other interlaces with the filling to form the ground. Loops are formed across the warp on every third pick on the three pick terry weave. The let-off motion slackens up on the warp pile beam to form the loop on the third or last pick.

The reed is also arranged so that it does not move forward all the way on the first two picks. These picks are not beat up all the way but are left a short distance from the fell of the cloth. When the third pick is woven, the reed moves all the way and beats up all three picks at one time.

The picks slip along the ground ends that are tight and push the warp pile out in the form of loops. Loops can be formed singly or in pairs. There are also four, five, and six-pick weaves, as well as three-pick weave.

Most standard towels are woven in the gray and then bleached and finished. If colored yarns are used for decoration or borders, they must be fast to bleaching. In the more expensive towels, the yarn is usually bleached before it is woven.—Textile World, July, p210

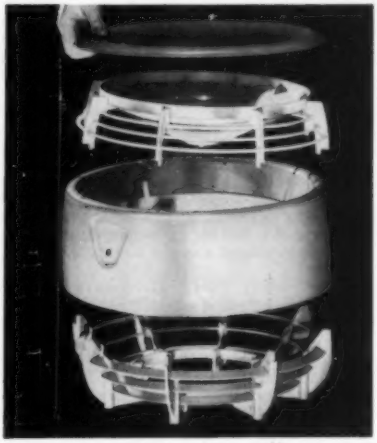
Saw Speeds Skin Fitting

Production time on the Boeing B-47 has been reduced by a new power trimming saw that permits cutting body skin while on the framework. Saw is driven by a 1½-hp. air motor and is guided by flexible steel track fastened to body of airplane. Blade is set with tungsten-carbide teeth, which do not clog up with soft metal.

Process starts with riveting of initial section, which is cut slightly oversize, then edges are trimmed to size. The next sheet, its edge slightly overlapping the first, is riveted a few inches from the edge. The saw travels along this edge and trims the second to size, allowing it to snap into place with little clearance.—Aviation Wk, June 12, p18

Smokeless Openhearths

In an effort to eliminate smoke and fumes in openhearth, Columbia Steel Co. is installing electrostatic precipitators. Openhearth gases will first pass through a large boiler to cool them from 1300° to 500° F. and then through the precipitators for solid removal. If the installation is successful, it will be the first time that smoke has been eliminated in an openhearth furnace.—Iron Age, June 22, p79.



MADE POSSIBLE BY PLASTICS

Both base and grille of Freah'nd-Aire Circulator could not have been made at a reasonable cost by any method or material except by use of large plastic injection molding techniques. Top disk is compression molded. Other parts are injection molded of Styron. —Modern Plastics, July, p56

New Products

Hobs Gears—Model 16-16 gear hobbing machine gives close control over finish and accuracy. An automatic hob shifter can be mounted integral with hob slide to reset hob in new cutting position after each machine cycle. It shifts in increments of 0.0026 in. Machine requires only one full set of gears for universal operation.—**Barber-Colman Co.**—Iron Age, June 8, p38

Sand Blaster—Removal of paint or corrosion from metallic surfaces can be done quickly by portable sand blaster. Machine weighs 42 lb. and is mounted on casters. Single loading of sand will operate for 1 hr. A 1½-hp. compressor provides the blast.—**Gordon Mfg. Co.**—Fleet Owner, July, p76

Removes Welding Flux—Compound 33, a pre-paint metal cleaner, removes oil, cleans off rust, and dissolves soldering or welding flux in one application. It may be applied by spray, soak tank, or hand swabbing.—**Oakite Products, Inc.**—Weld Eng, June, p44

Measures Low Pressures—Model 179 micromanometer measures pressures from 5-50 microns. It consists of sensing unit and separate electronic indicator that can be mounted at a distance from sensing unit.—**Clark Instrument Corp.**—Electronics, July, p124

Less Power, Drill Faster—Production cutting hard and soft metals, plus removal of taps, drills, and reamers, can be done with the Electron Drill. It uses ¼-in. electrode 36 in. long and operates from 60-c., 110-v. system.—**Elox Corp. of Mich.**—Am Mach, June 12, p143

Rejects Off-weight Units—Automatic weight-classifying scale checks cases, cartons, other containers. Scale, when installed in conveyor line, passes cartons of correct weight but rejects off-weight cartons to a separate conveyor or stops main conveyor as desired. Capacity is 15 containers per min.—**Toledo Scale Co.**—Food Ind, July, p91

Woven Wire Slings—Slings are available in standard widths of 3 to 20 in. and in lengths from 36 to 132 in. They are fabricated of wire and mesh produced from any metal or alloy. Handles permit use of choke or basket hitch.—**Cambridge Wire Cloth Co.**—Cons Meth & Equip, July, p125

Aluminum Nails—Costing less than copper or brass, they need not be countersunk and puttied. They are corrosion resistant and leave no rust stains on wood sidings. —**Nichols Wire & Aluminum Co.**—Business Wk, June 24, p46

Combination Shakeout — Foundry unit combines shakeout, sand screen, lump breaker, feeder belt conveyor, and tramp metal trap. Flask is placed on top deck actuated by vibrator. Screened sand is discharged by conveyor belt.—**Hewitt-Robins, Inc.**—Foundry, July, p188

SHOP ELECTRON MICROSCOPE

Simplified 30-in. table-model electron microscope will broaden use throughout industry. Cost is one-third of large model. Small size was made possible by development of new permanent-magnet lens system to replace conventional electro-magnetic and electrostatic lenses. Magnification is to 6,000 times. Unit is made by Radio Corp. of America.—Chem Eng, June, p150

Detergency Comparator—Designed to compare detergents under the conditions of high concentration and low bath ratio, comparator is essentially a pair of dolly washers scaled down to laboratory size. It is made of stainless steel, has thermostatically controlled electrically heated outer water bath. Baffles prevent suds from cross-contamination.—**Riggs & Lombard Co.**—Textile World, July, p178

Explosion-proof Fan—Type X propeller fans are for hazardous locations: oil refineries, print shops, chemical plants. Propellers are aluminum, and motors explosion-proof. Eight models are available for static pressures to ½ in.—**Ilg Electric Ventilating Co.**—Elec C&M, July, p135

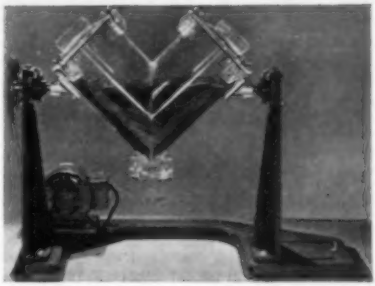
Tests Diesel Water—Low-cost, on-the-spot testing of diesel water can be done with Chromokit. Cooling-water sample is placed on test card. Color reaction is matched with standard color guide to show chromate strength.—**Dearborn Chemical Co.**—Power, June, p148

Angle Caster—New caster for lightweight equipment rolls over objects and moves easily on rough floors. It consists of 3-in. wheel on swivel base mounted to roll at an extreme angle.—**Bassick Co.**—Oper Eng, July, p70

Weed Killer—New chemical is designed to kill practically all types of vegetation. It can be applied in original powder form or dissolved in water for spraying. Weed killer discourages regrowth and retards burning.—**Chipman Chemical Co.**—Railway Age, July 8, p94

Cable Reel Grab—Unit handles copper-wire reels 26 in. wide and 40-in. O. D. with 5-in. dia. cores. Reel has motor-driven expanding arbor. Double-hoist carrier used with grab hoists, carries, and turns reels to any position.—**Cleveland Crane & Engrg. Co.**—Steel, June 26, p94

Resin Raises Wet Strength—Plaskon aminoplast is claimed to supply almost twice the strength for paper as an equal amount of urea resin. Applications: paper draperies, diapers, kraft bags, toweling. It should be added to the stock at the headbox.—**Plaskon Div., Libbey-Owens-Ford Glass Co.**—Paper Ind, June, p328



TRANSPARENT BLENDER

For use in laboratories and pilot plants, a transparent unit has been announced by the Patterson-Kelly Co. The V-shape insures a thorough blending. Timing, capacities, and efficiency of blending are comparable with results expected from production units. Transparency of the unit allows observation of the process. Two sizes of laboratory blenders are available: 4 qt. and 8 qt.—Mod Plastics, July, p142

Electric Motor Has Gears—Four possible primary and eleven secondary gear ratios are combined with an integrally mounted electric motor in this new four-speed transmission. Both constant-torque and constant-horsepower two-speed motors are available in 1, 1½, 2, 3, and 5 hp.—**Lima Electric Motor Co.**—Prod Eng, June, p166

LP Gas Torch—A 2½-lb. cartridge-refill torch, which lights instantly without preheating, reaches a calculated temperature of 3660° F. Tank of fuel will operate the burner for many hours, depending on flame size. Single control valve turns torch on and off and adjusts flame.—**Otto Berns Co.**—Hardware Age, June 29, p91

Jet Fuel Heating System—Use of hydrogen peroxide for jet engine starting is advantageous because of its rapid decomposition into oxygen and steam upon exposure to a catalyst. Drawback is its high freezing point which the new system overcomes.—**A. V. Roe Canada, Ltd.**—Aviation Wk, June 19, p43

New Products (Cont.)

Engines Air-cooled—Two air-cooled industrial engines are offered in low-profile models. Ratings are ¾-1 and 1½ hp. Height is 9½ in. Specifications: single cylinder, four cycle, 2⅛-in. bore, 2-in. stroke, 7-cu. in. displacement, 5.2 to 1 compression ratio.—**Continental Motors Corp.**—Prod Eng, July, p170

Fast-change Wrapper—Model EZA semi-automatic wrapping machine is multi-purpose, low-cost unit. It wraps objects to 3½ x 12 x 8 in. in standard envelope-type fold at speeds to 20 per min. Change-over to different size wrap takes 5 min.—**Knapp Mfg. Co.**—Food Ind, June, p91

Sliding-column Grinder — Vertical-spindle Hydrovert surface grinder has sliding column to permit grinding close to shoulders and to get around guide pins in die grinding. Sizes range from 16x24x48 in. to 48x24x192 in. Work many times the diameter of wheel can be ground. Flat surface in steps are precisely ground regardless of other obstacles.—**Thompson Grinder Co.**—Am Mach, June 26, p130

WORK AND QUENCH TABLE

Combination table, made by Lepel High Frequency Laboratories, Inc., can be attached to vacuum-tube or spark-gap converters. With sink cover on, unit forms work table for mounting coils and fixtures. Removing cover exposes 24x24x18-in. quench tank.—Electronics, July, p186

Fingertip Wrench—New wrench can be used in tight places and out-of-sight locations to place and hold nuts without fumbling. Wrench is worn like a thimble and picks up nut in hexagonal opening. It is made of nickel-plated steel and is supplied in sets of four to fit ¼, 5/16, 11/32 and ⅜-in. hex nuts.—**F. E. Redfield Co.**—Aviation Wk, July 3, p32

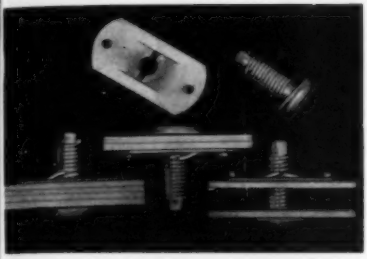
Belted Generator—Unit may be belted to any available power source or tractor to supply electricity when main line fails. Generator is four-pole, self-excited type designed for operation at 1,800 rpm., 60 c., 120 v. Two available sizes are 3 and 5 kw.—**Fairbanks, Morse & Co., Inc.**—Power, July, p152

Rotary Masonry Drill—Carbide-tipped rotary drill bit features two spiral flutes for removing dust and providing maximum body strength for the drill. Advantages claimed are: no cleaning of hole, no stalling, removal of dust as it is drilled, and lower temperatures. Sizes available are 3/16 to 1 in.—**New England Carbide Tool Co.**—Eng News-Rec, June 22, p113

Flexible Varnish—No. 123 insulating varnish stays flexible after baking. This makes it useful for impregnating transformer and other coils. It has excellent bonding characteristics, high dielectric strength, high resistance to oils.—**Irvington Varnish & Insulator Co.**—Elec West, June, p46

Unloads Hopper Cars—Belt-type unloader removes solid materials from hopper cars to stock-piling conveyor or other take-away device. It can be powered with either electric motor or gasoline engine. Power is transmitted to belt by chains on each side of belt.—**Lippman Engrg. Works**—Chem Eng, June, p148

Improved Axminster Loom—Featuring an upward cutting action with an inverted cutting knife and multiple-cutting blades, gripper loom is said to speed production by keeping greatest percentage of colors above the gripper at the moment of gripping. The weaver can "pick" a lost end without stopping the loom. Ten colors are accommodated.—**Boucher & Co., Ltd.**—Textile World, July, p174



VIBRATION-PROOF FASTENER

New fastener will not loosen under the most severe vibration, according to manufacturer, South Chester Corp. Fastener employs a spring as a thread, which acts as shock absorber and effectively cushions vibration. A single fastener length will serve panels ranging from minimum total thickness of 0.075 in. to maximum of 0.500 in.—Ind Distribution, July, p123

Canned-fuel Torch—Portable hand torch lights with a match and gives a 1200° F. flame for brazing and soldering. Fuel is supplied in disposable can that seals into the torch. Fuel is blend of liquid petroleum hydrocarbons that is self-pressurizing and self-vaporizing.—**Pressure Products Corp.**—Weld Eng, June, p45

Splices Coaxial Cable—Copper clamp will prove convenient when a television set is to be moved beyond range of existing cable length. Vinyl sleeve fits over the clamp and is taped at both ends.—**Brach Mfg. Co.**—Electronics, July, p180

Ceiling Ventilator—Model 1201 has 4-in. blower wheel driven by 1/75-hp. motor located outside air stream. Over-all dimensions are 6⅛ x 7⅛ x 7½ in.; capacity is 100 cfm.—**Trade-Wind Motorfans, Inc.**—Elec Merch, June, p144

Battery Charger—It's a single-circuit rotating-type battery charger with more than 2,000 possible adjustments. Lead-acid and nickel-iron-alkaline batteries can be charged. Automatic features include battery cut-off and charger shut-down when fully charged.—**General Electric Co.**—Factory, July, p134

Fork-truck Scoop Attachment—Hydraulic operation through entire cycle of loading and dumping is offered. Scoop handles small castings, stamping, scrap steel, gravel. Easy to install and remove, it is interchangeable with standard forks.—**Clark Equipment Co.**—Auto Ind, June 15, p54

Tweezer Welder — Resistance-welding tweezer electrodes are made to join filaments and wires in radio tubes, switches, thermostats, instruments, and similar products. Welding current is supplied from condenser power units available in 100, 200, and 250 microfarads.—**Federal Tool Engrg., Inc.**—Weld Eng, July, p44

Electric Brakemotors—All types of Tri-Clad motors up to 20 hp., 90 lb.-ft. static torque are available with explosion-proof, electrically operated brake. Uses include cranes, hoists, conveyors. Brake continues to hold even if power fails because of spring-set solenoid-release design.—**General Electric Co.**—Elec World, June 12, p29

Flame-sprays Coating—New flame-sprayed membrane coating for steel surfaces resists acids, alkalis, salt solutions, and some solvents. Material is polyethylene resins to which modifiers have been added. Coating is done only by manufacturer.—**Nukem Products Corp.**—Chem Eng, July, p148

Porosity-free Castings—Magnesium, alumium, and copper alloys can be injection molded relatively free of porosity by model 400-M hydraulic die-casting machine. Pressures within die cavity are confined by high sustained injection pressure through the cold-chamber system. Maximum production is 125 shots per hr. Clamping pressure is 400 tons.—**Hydraulic Press Mfg. Co.**—Steel, June 5, p137

READER SERVICE

As a special service to our subscribers, McGraw-Hill Digest will furnish without any charge, additional information about any new product or technical development described. Address your letter to: The Editor, the McGraw-Hill Digest, 330 West 42nd St., New York 18, N. Y., U. S. A. —*THE EDITORS*

GOOD PRACTICE in shop layout permits easy access to working areas

RAILROAD-BUILT CART simplifies work of removing air reservoirs

Diesel Repair Shop Trends

Facilities tend toward standardization with emphasis on converting existing structures while repair practices show more individuality

RAILROADS are gradually taking on more of the repair and reconditioning work of diesel locomotives. They have acquired more knowledge of the intricacies of diesel engines and electrical equipment. Some roads have learned from over 10 years experience, while others gain the necessary information from roads with experience and from manufacturers' representatives.

The net result is a pattern that is becoming increasingly standardized at the same time that more individuality is being shown. Shops and servicing terminals are basically similar. Individuality appears in maintenance methods, types of machinery, and in jigs and fixtures developed to simplify the work.

Efficient repair shops are housed both in new structures and in existing steam maintenance buildings. Conversion from existing facilities to diesel operation can be made for a quarter to half the cost of a new layout. The steam shops are large enough to permit concentrating diesel repairs. Machine shops, materials-handling equipment, and track space are available. Relocation is not required.

The tendency to use existing structures appears likely to grow in popularity. Many roads have no intention of replacing entirely their steam locomotives. There is, therefore, a continuing demand for a portion of the steam repair space for repairing steam power.

A characteristic of modern diesel shops is the careful attention given to materials handling. Travel distance is reduced, and movement efficiency is increased. The number of times parts and materials must be handled is minimized. Special conveyances have been built to handle a wide variety of objects. All serve the same purpose—to move things from one point to another with the greatest economy.

One change that is taking place gradually but progressively and continuously is the development of individual maintenance methods. More attention is being devoted to developing ways to improve the quality of repair work and to do it cheaper.

Welding offers a good example of how cooperation between the railroads and the manufacturers can cut maintenance

costs. Its use has been extended to a variety of operations. Broken cast-iron engine bases have been repaired at an estimated savings of $5,000 compared with the cost of new bases.

As shop personnel have become more experienced, they have developed tools, jigs, and fixtures to help them in their work. Some of these were built to overcome a handicap in a particular shop, but most have application to shops and servicing points in general.—Railway Age, June 24, p72

Wheel Hubs Cast on Spokes

Making of wheels for farm implements involves an interesting casting operation at the New Idea Div., Avco Mfg. Co. Continuous production is set up in an area paralleling the foundry molding floors.

Strip steel is cut to size, punched for spoke holes, formed to circular shape, and welded to become the wheel rim. Spokes are inserted and forged in place.

The wheel moves to the pouring line where the hubless wheel is clamped in a fixture. The fixture provides a chill mold into which a core is placed for the wheel bore. Iron is poured by hand ladle into the mold. The solidified hub places the spokes under tension to make a rigid assembly.—Foundry, June, p88

High Capacity Mine Skip

Rubber wheel mountings and ball bearings make a skip at the Tennessee Copper Co. mine run easily with a greater load. The skip is cylindrical in shape with wheels mounted directly to the shell, eliminating axles.

Compared with other models the new skip is: easier to build; easier to maintain; and lighter in weight with greater capacity. An increase of 820 lbs. per trip is reported.—Eng & Min J, July, p63

LP-Gas Conversion Factors

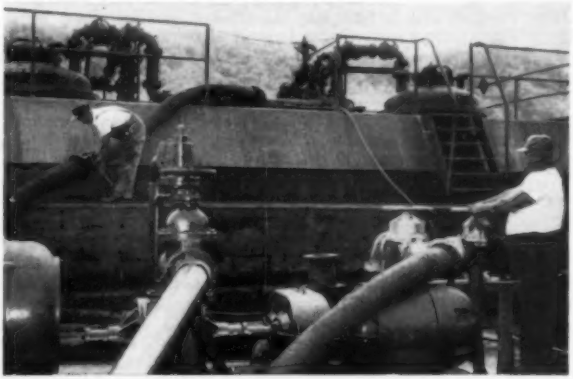
Conversion from diesel oil to liquefied petroleum as a fuel for truck engines requires a careful study.

Advantages: longer engine life, decreased maintenance costs, cleaner performance.

Disadvantages: at least 35 trucks are needed before conversion and bulk storage installations become economical. Long-distance hauling requires widely scattered storage depots.—Fleet Owner, July, p63

BARGES MOVE MURIATIC ACID

Since 1947 Dow Chemical Co. has been shipping hydrochloric acid by barge. Five new barges have four tanks each of 73-ft. length and 12-ft. dia. They are largest rubber-lined tanks in use on barges. Loading is done with 4-in. Saran hose leading from 6-in. rubber-lined steel pipe on the dock.—Chem Eng, July, p108



Several Practical Hints on How to Overcome the Heat

Air-cooling systems are expensive. Here are some ways to keep a plant cool without air conditioning:

• Keep sun's direct rays from windows. Insulate roof and side walls. Use heat reflecting materials on exterior roof surface, or spray water on the roof.

• Eliminate indoor sources of extra heat. Insulate all exposed hot surfaces. Ventilate hot vapor processes with exhaust hoods.

• Make the best of natural ventilation. Keep room air moving. Open all windows on the windward and leeward sides of the plant. Keep windward monitors closed.

• Move the air in the plant mechanically. Motor-driven roof ventilators move air in and out. Try fans in dead-air areas to move air with the wind.

• Provide facilities for cool drinks. Educate workers on benefits of proper dress, frequent bathing, and diet. Keep salt-tablet dispensers in areas where workers perspire excessively.—Factory, July, p73

Photocells Count Beer Cases

Other brewers and, in fact, any manufacturer who handles cased goods can adopt the efficient counting technique used so successfully by Haffenreffer & Co., Inc.

The system at this Boston brewery has photoelectric units on the conveyor lines and four master control boxes in the shipping office. A master controller can be set for the number of cases to be delivered, at which point a cell-operated switch stops the conveyor.

Adjacent to each control box are three sets of indicating counters. First set keeps daily record of all cases, second of quart cases, and third of truckloads of quarts. Four sets of counters keep records on incoming empty cases.—Food Ind, June, p50

PIPE EXPANDED HALF AN INCH

Steel pipe can be expanded ½ in. in diameter and strengthened at the same time in National Tube Co.'s new pipe mill. Pipe goes through U-ing and O-ing presses, welding machines, flux removers, and inspection stations. A tapered ram and rubber gasket seal each end and four-section die is placed around pipe. Controlled internal water pressure expands pipe to size of die. Entire seam is visually inspected for leaks.—Steel, May 29, p34

Fork Handles Floor Forms

Up to 80% savings in lumber and labor were had in construction of a shopping center through use of a fork truck to handle 20 x 20-ft. panel floor forms. Forks were lengthened. Forms were mounted on four timber tower legs.

Forms were placed after footings were poured, then were leveled by hydraulic jacks. Concrete for columns was poured in Sonotube paper forms. Slab was poured next.—Cons Meth & Equip, June, p46

Purifying Crude Glycerine

Ion exchange is an efficient method to remove ionized solids (ash) and color- and odor-producing materials from crude glycerine. Advantages: uniform product, low operating cost, product stable to light, and no foots produced.

Aqueous glycerine solution is passed in series through a cation and an ion exchanger, or through a mixed bed of cation and anion exchanger, or through

a combination of units. First passage through a single pair of beds removes 90% or more of ionizable materials, while second passage will leave 1% or less.

Operating costs include regenerant chemicals—sulphuric acid and caustic soda—as well as resin and equipment amortization, labor, and evaporation. In general, ion exchange is cheaper than distillation for crudes with less than 10% of ionized solids and for sweetwaters with less than 2%.—Chem Eng, July, p109

Two Notes from Europe

Uncertain conditions in Germany are reported to have spurred Mercedes-Benz to study the idea of moving its entire operations to Brazil. The company, now employing 20,000 skilled workers, would like to assemble cars in Brazil, perhaps with engines made under license by National Motor Factory.

First "Gyro-Bus" was displayed at Swiss Industries Fair at Basle. It has electrical flywheel drive. Before each trip, flywheel is accelerated to 3,000 rpm. by connecting 3-phase motor to power supply. Energy carries the bus 4 mi. before it needs 1-min. recharging.—Am Mach, May 29, p59

How to Find Condenser Leaks

Harbor Stream Plant in Los Angeles has 55,428 condenser tubes to be checked when leakage occurs. Old methods were too slow, so a new one has been developed that reduces unit outage time.

Turbine is shut down, condenser vacuum is broken, cooling water is shut off, waterboxes are drained, and exhaust-casing manhole cover is removed. Steam side is filled with city water to which 10 ppm. of fluorescein ($C_{20}H_{12}O_5$) has been added.

With condenser full, inspector enters waterboxes and locates leaks by a portable ultraviolet lamp. Leakage of fluorescent solution is shown up by yellow-green or red light.—Power, July, p96

New Synthetic Rubber

Polybutadiene, or PB rubber, is made without styrene. Developed by Phillips Petroleum Co., the rubber is claimed to be superior to GR-S synthetic rubber and equal to cold rubber in quality. Shortage of benzene, from which styrene is made, is limiting GR-S production. PB rubber process mixes high-abrasion furnace carbon black with polybutadiene latex before conversion to solid rubber.—Oil & Gas J, June 29, p108

Profit Opportunities This Month

In your line of business, do you have to know about or are you interested in:

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What Coal Industry Needs to Reach New Mining Horizons:

- ***Maximum use of modern equipment and materials for lower costs and higher quality. More skillful men and assembly-line methods.***
- ***Planning for maximum progress must take in everything and every man—from the mine to the consumers firebox—and beyond in the legislative halls and the forums.***
- ***Adequate engineering talent — in both industry and equipment-manufacturing. Research, sales, and public relations must be developed to capitalize on the gains made at the mines.***

Future Coal-Mining Operations

EFFICIENT SERVICE should be given careful consideration in any planning for the coal industry since it ultimately fixes the limit on over-all tons per man. Three of the goals are:

1. Equipment and facilities requiring minimum maintenance.
2. Maximum use of high-capacity equipment.
3. Maximum use of automatic controls.

All the operations performed on the coal after it enters the main-haulage system is called service. Improvements in service efficiency offer the possibility of a major cost reduction.

In strip mining, direct mining productivity substantially exceeds that of service. Consequently, strip mining has a definite advantage over deep mining in normal overburden.

Opportunities in Stripping

Strip mining now accounts for a large percentage of coal production, reflecting the economies in manpower made possible by a high degree of mechanization. Stripping should supplement deep mining wherever conditions make it possible. Furthermore, stripping might well be supplemented by deep mining to extend recovery at a reasonable cost when overburden depth exceeds the maximum that equipment in service can handle.

Coal stripping should make maximum use of machinery. The equipment should be given the best possible opportunity to work at or close to capacity for most efficient use of manpower at lowest cost.

The opportunities for cutting cost in stripping fall into two general classes:

1. Increasing operating time per stripping and loading unit, involving advance planning and efficient conduct of drainage, overburden preparation, haulage, maintenance, and other activities.
2. Use of large equipment, thereby reducing labor and other costs.

Opportunities in Loading

Mechanical-loading equipment is inherently cost-cutting equipment because it increases individual productivity. Since productivity in face operations is normally less than in service operations, it is logical to concentrate on this phase of the mining problem.

For maximum results, two steps must be taken:

1. Installation of the best machine available for use under the prevailing mine conditions.
2. Operation of the machine to achieve

as near to its rated capacity as possible.

Several mining-and-loading machines, commonly called continuous miners, will probably be announced in the near future. By substituting electrical for explosive energy and combining the breaking and loading functions in one unit, the continuous miner eliminates cutting, drilling, bugdusting, and shotfiring, with a substantial reduction in the number of men per crew. The continuous miner offers the possibility of a major increase in tons per man at the face.

Better Face Transportation

Expenditures in both money and effort to increase efficiency in other phases of the cycle will fail if coal cannot be moved out as fast as it is produced. Without efficient transportation to back up the loading facilities and auxiliary equipment, maximum production cannot be realized.

The goal should be a transportation system that is always in place and ready to receive and carry coal any time loading is in progress. Furthermore, the system should have sufficient capacity to handle any peak rate of production the loader or miner is capable of reaching. Finally, the system should operate with a minimum of manpower and maintenance.

This requirement involves elimination of both indirect and direct delays and the use of low-maintenance equipment with adequate capacity, speed, and ability to operate as nearly continuously as possible. Finally, it means haulage and working layouts that assure maximum efficiency in service to production equipment.

More Power Needed

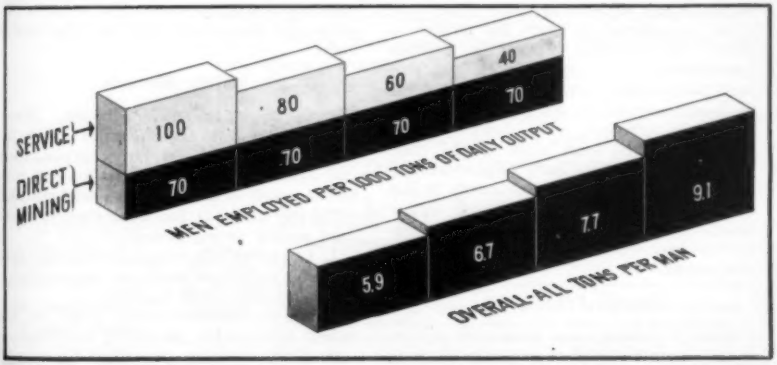
Mechanical mining demands good power. Insuring maximum power efficiency and lowest power cost is largely a matter of engineering and management.

Low voltage and interruption affect cost and efficiency in many respects:

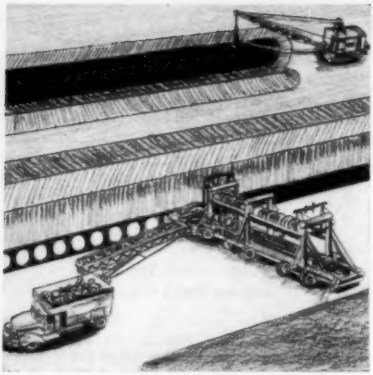
1. Production drops as a result of slower operation of equipment and more service interruptions.

2. Men working with bad power are not inclined to put forth their best efforts.

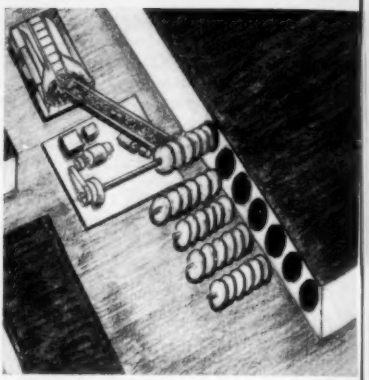
3. Breakdowns from overheated motors and auxiliary equipment cut output



SERVICE LABOR *is the key factor in cost. Over-all tons per man reflects changes in service efficiency. If 70 face men produce 1,000 tons, efficiency with 100 service men is 5.9 over-all tons per man. With 40 service men, service efficiency increases to 9.1 over-all tons per man.*



NEW STRIPPING UNITS *with added range and new auxiliary equipment and methods promise further cost reduction in the future.*



NEW MACHINES AND NEW METHODS *promise large increases over present tons-per-man-shift levels in both thick and thin coal.*

and severely increase maintenance cost.

4. Power cost is increased through waste of energy and prolonged demands.

Future operations will require more power per ton of coal. Eventually the internal-combustion engine will power locomotives and other mobile equipment. Electricity, however, will remain the major power source for some time.

Ac. is expected to carry the burden of power requirements. Use of three-phase transformers will increase on the surface and underground as improvements in design are made. Ac.-to-ac. step-down is simple, efficient, and cheap. Transformers can be kept close to the load.

Better batteries and engine-battery service will provide improvements in d-c. service to underground mining equipment. Engine-generator-battery combinations are being suggested for mobile equipment.

Quality Preparation

Quality is now more than ever a vital factor in coal's market position. A well-prepared coal possesses the following major characteristics:

1. Low impurity content.
2. Correct size for the job.
3. A high degree of uniformity in both impurity content and size.

In particular more emphasis will be placed on beneficiating the extreme fines —less than $\frac{3}{8}$ or $\frac{1}{4}$ in. down to 100 or 200 mesh. Improved cleaning equipment and methods are being developed to meet the increased demand of new burning equipment.

Safety Methods

Safe work is efficient work. Many benefits can come from a reduction in injuries and fatalities, in compensation and other accident costs, in loss of production, and in damage to mine facilities.

Tested methods for achieving accelerated safety progress are:

1. Organization reinforced by management backing and employee cooperation.
2. Education and training.
3. Plant and equipment kept in the safest practicable operating condition.
4. Safe working practices backed up by logical working rules.—Coal Age, July, p69

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Revolutionizing Production with Hydraulics Since 1877

Production Ideas

from Manufacturers' Catalogs

9-1 Silicone Rubber—International General Electric Co. 24p. Bulletin CDP 584 covers silicone chemistry, adhesives, and properties, applications, and forms of silicone rubber. Includes valuable engineering tables.

9-2 Chemicals for Insecticides—Atlas Powder Co. 8p. Bulletin discusses surface active agents for insecticides and herbicides, their characteristics, and selection.

9-3 How to Make Pipe—Republic Steel Corp. 20p. Booklet tells how pipe is made by resistance welding. Included are essential tables of weights, dimensions, and hydrostatic test pressures.

9-4 Materials-handling Studies — Rapids-Standard Co., Inc. Series of 4-p. field reports on experiences in different companies show solutions to specific problems.

9-5 Ammonia Compressors—York Corp. 24p. Booklet on V/W compressors is a strip-film type of presentation.

9-6 Rotary Gear Shaving—National Broach & Machine Co. 28p. Bulletin S-49-5 covers theory and practice of gear shaving, while bulletin AP49-4 is a digest of Red Ring products.

9-7 Electrical Insulation — Owens-Corning Fiberglas Corp. 36p. Catalog gives complete details on Fiberglas electrical insulating materials, including yarns, cords, sleeving, tapes, cloths, sheets, and laminates.

9-8 Electrical Maintenance—Allis-Chalmers Mfg. Co. 24p. "Care of AC Rotating Equipment"—bulletin 05R7417—emphasizes both preventive maintenance and machine repairs.

9-9 Miscellaneous Pumps—Byron Jackson Co. 36p. Six bulletins cover the following: 49-5100 and 50-5150—deepwell turbine pumps; 50-5300—submersible pump; 50-7600—sump pump; 50-7650—tail water pump; 50-9200—bulk station pump.

9-10 Water Treatment—Dearborn Chemical Co. 24p. Bulletin 5000 covers equipment and methods for treating boiler feedwater and describes engineering service available.

9-11 Makes Distilled Water—F. J. Stokes Machine Co. 16p. Catalog 601 describes automatic water stills for ½-100 gph. Specifications given on 21 models.

9-12 Modern Agriculture — International Harvester Export Co. 32p. Booklet E-97-NN gives a comprehensive picture of the working tools and practices of modern agriculture. Equipment shown covers the entire industry from field to farm house.

9-13 Press Brakes—Cincinnati Shaper Co. 72p. Catalog B-2A describes and illustrates press brakes and gives extensive information on tooling and operation. All kinds of brake dies are shown.

9-14 Controls Weather — American Moistening Co. 24p. Catalog 2 treats humidification and cooling systems for textile mills.

9-15 Synthetic Woven Fabrics—Chicopee Mfg. Corp. of Georgia 22p. "Lumite Woven Fabrics" gives complete details on screen cloth and other synthetic fabrics.

9-16 Cylindrical Grinders—Landis Tool Co. 28p. General catalog offers universal, plain, roll, crankshaft, cam, valve, multiple-wheel, and race grinders.

9-17 Truck Casters—Bassick Co. 104p. Catalog 124 describes the many types of casters offered. Section on special equipment and casters is of unusual interest.

9-18 Process Pump—Stewart-Warner Corp. 16p. Bulletin 38-688 describes the Versatal pump for handling licorice, paint, glue, adhesives, insulation, sealing compounds.

9-19 Salt-water Corrosion — International Nickel Co., Inc. 17p. "When Metals Go To Sea" tells what happens to metals in sea water and what to do about it.

9-20 Nitrocellulose Lacquers — Hercules Powder Co. 32p. "Packaging and Paper Lacquers" reports on extensive investigations made on formulations and materials for lacquer coatings on paper.

9-21 Gravity Conveyors — Standard Conveyor Co. 24p. Bulletin 63-A covers gravity conveyors completely and also has section on portable belt conveyors.

9-22 Bar Machines—National Acme Co. 12p. Bulletin M-50 describes Model M single-spindle automatic bar machines of sizes 2¾, 3½, 4¾, and 5¾ in.

9-23 Shear Knives—Heppenstall Co. 48p.

Production Ideas (Cont.)

"Shear Knife Handbook" covers specifications, grinding, and care of knives as well as data on other products.

9-24 Injection Molding—Reed-Prentice Corp. 8p. Bulletin describes models 5A, 10D, 10E, and 10H injection molding machines.

9-25 Upright Drills—Cincinnati Bickford Tool Co. 24 p. Booklet U-25 illustrates line of 21- to 28-in. drilling machines.

9-26 Distribution Apparatus—Westinghouse Electric International Co. 91p. Catalog 50-000 covers complete line of distribution apparatus as to features, prices, construction, dimensions, and application data. Includes many tables.

9-27 Kellogram—M. W. Kellogg Co. 12p. Issue No. 3 of 1950 series covers unique combination units—deasphalting and cracking—used to modernize a Montreal refinery.

9-28 Drills Oil Wells—Joy Mfg. Co. 12p. Bulletin RM-703 describes use of No. 200 series oil-field motorized rig for drilling to 3,000 ft. with exploration pipe.

9-29 Centrifugal Pumps — Pacific Pumps, Inc. 152p. Complete set of Pacific bulletins covers all kinds of centrifugal pumps for all kinds of applications and also plunger pumps for oil-well service.

9-30 Flat Grinding—Gardner Machine Co. 44p. Catalog 148 covers full line of flat surface grinding equipment, including single-spindle, double-spindle, rotary, swinging-arm, and sliding-knee machines.

9-31 Hydraulic Presses — Birdsboro Steel Foundry & Machine Co. 24p. Bulletin C-1A covers hydraulic presses for sheet-metal stamping and includes tables on pressing speeds and size specifications.

9-32 Metal Cleaning—Oakite Products, Inc. 44p. Booklet gives many useful hints on the whole field of cleaning metals.

9-33 Battery Handbook—Gould Storage Battery Corp. 36p. Pocket-size handbook contains technical instructions and engineering data on motive-power, rubber-jar, lead-acid storage batteries. Sections on care and maintenance are valuable.

9-34 Contractors Pumps—Jaeger Machine Co. 52p. Catalog P45 describes and pictures complete line of Sure Prime water pumps up to 240,000-gph. capacity.

9-35 Electrical Contacts—Fansteel Metallurgical Corp. 36p. Bulletin M-105 is a comprehensive treatise on electrical contacts.

9-36 Precision Tools—Dumore Co. 28p. Catalog covers tool-post grinders, flexible-shaft tools, hand grinders, high-speed drilling equipment.

9-37 Sample Polisher—Precision Scientific Co. 32p. Catalog 860 describes preparation of metallographic specimens and equipment needed.

9-38 Socket Screws—Parker-Kalon Corp. 16p. Bulletin 490A gives complete details on cold-forged socket screws and bolts.

9-39 Metal Building Panels—Detroit Steel Products Co. 40p. Catalog gives complete information on steel and aluminum panels.

9-40 Tools—Red Devil Tools. 80p. Catalog 20 offers glazier's tools, scrapers, paint-conditioning machines, floor-conditioning machines, and specialties.

COPIES of these manufacturers' catalogs will be sent free to subscribers. Fill in squares with catalog numbers desired and mail to the Editor, McGraw-Hill Digest, 330 W. 42nd St., New York 18, N. Y., U. S. A.

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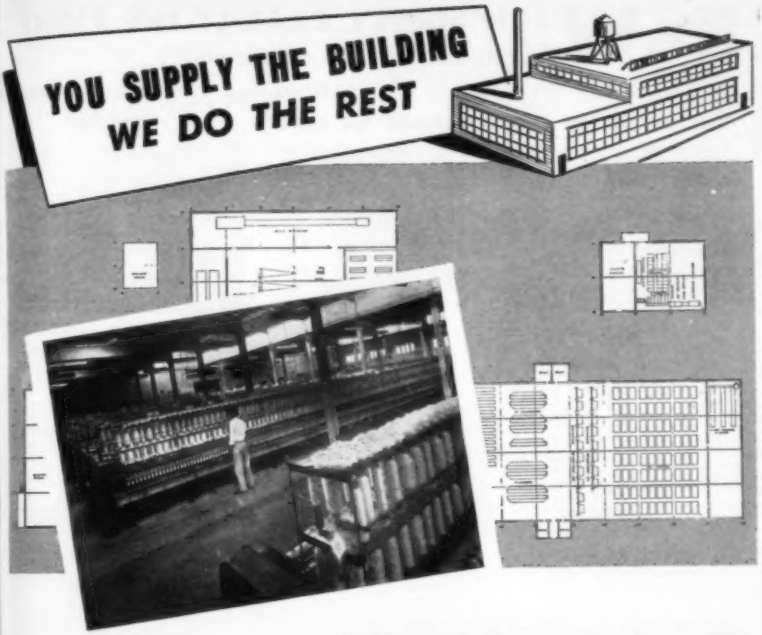

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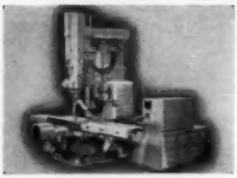

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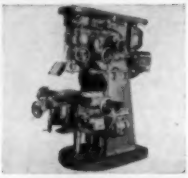

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4. P&W JIG BORER

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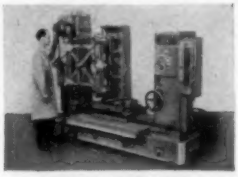
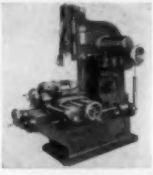


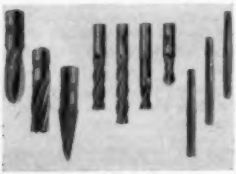
5. P&W AUTOMATIC DUPLICATING MACHINE

Ideal for automatically duplicating forging dies and bottle molds.



6. P&W VERTICAL SHAPER

For shaping contours, reliefs in blanking, trimming dies and similar work.



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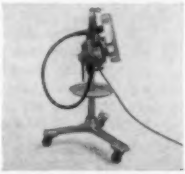

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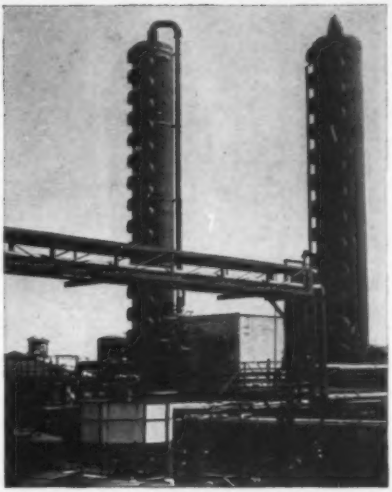

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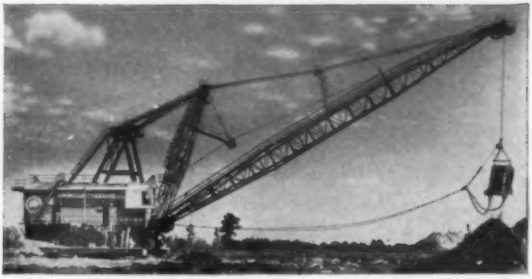
ALUMINUM SULFATE plays an important part in the treatment of wastes from large industrial plants, many of which maintain their own waste-treating units such as the one shown above. Aluminum Sulfate, produced by Cyanamid, is an efficient coagulant, it forms a voluminous floc which adsorbs and coagulates the suspended and colloidal particles. The resultant floc settles out readily.



ONE TON OF PHOSPHATE ROCK every two seconds can be moved by this huge drag-line at Cyanamid's mines. The world's agriculture depends on this phosphate for soil building and fertilization to produce bumper crops and good livestock.

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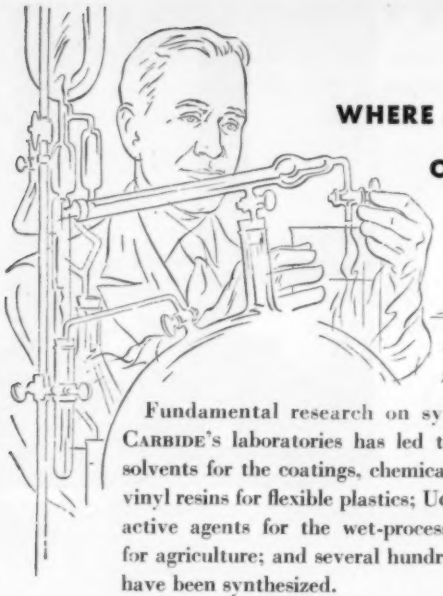

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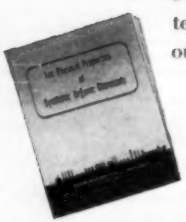

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If you would welcome reduced costs through fewer rejected units and greater production—learn more about General Electric silicones! Their chemical inertness, flexibility, and resistance to temperature make important savings possible for many manufacturers. For example, G-E silicone mold release agents have proved far superior to other mold lubricants in many factories. Their use often reduces mold cleaning costs, speeds production, makes possible finer finished products with fewer rejected items. CSI-69-1

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G-E silicone lubricants speed up die-casting production, make improved products possible.

This product of G-E silicone research, DRI-FILM, protects tiny electron tubes from moisture.

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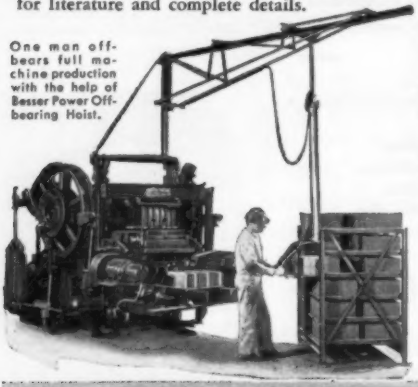
Do you want to make a really sound investment? Then consider the business of producing concrete block. An extremely active building industry has greatly stimulated the demand for concrete block. And if the plant is equipped with Besser Super Vibrapac machines, you are assured of maximum profits. A Besser Vibrapac produces high grade masonry units on a much faster, more efficient basis. It's fully automatic. No machine operator required. Accuracy of block dimensions is made possible by vibration under pressure. Vibrapac block are preferred by architects and builders everywhere, because they speed up construction . . . cut building costs . . . provide beauty as well as utility. Get the facts. Write for literature and complete details.



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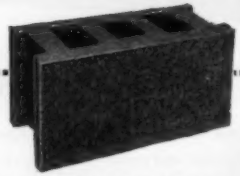

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BESSER SUPER VIBRAPAC — the modern, high-speed, fully automatic block machine. Produces three 7⅝x7⅝x15⅝" block at a time on one Plain Pallet. Other sizes in equivalent multiples.

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Complete Equipment for Concrete Products Plants

A Name You See On Precision Machine Tools Throughout The World . . .

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PRECISION BORING MACHINES

Typical of the machine tools that have made the Ex-Cell-O name famous are its machines for such metal working operations as precision boring, turning and facing. The Ex-Cell-O Style 1212-A Machine shown here accommodates small and medium size parts and may be tooled for work in small lots or large volume. One or more precision spindles or boring heads can be arranged on each machine bridge. The controls of the hydraulically operated machine table are easily adjusted to obtain an automatic cycle which may include rapid movement, two infinitely adjustable feed rates, immediate or dwell reverse and stop in both directions of travel.

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PRECISION MACHINE TOOLS • CUTTING TOOLS • MACHINES TO PACKAGE MILK IN SANITARY PAPER CONTAINERS

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In every part of the world and in every kind of industry in which goods and materials must be picked up, carried and stored, Clark has established an enviable reputation for unexcelled machines, for economical handling methods, and for painstaking installation including careful instruction of operators.

Reproduced below is a letter which describes instruction methods employed in Finland by the Clark distributor, Ins.isto H. Auramo of Helsinki:

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Those present included seven future truck drivers, two mechanics, five stockkeepers, time-study-men and engineers. The elementary course lasted five days and was followed by additional instruction for the last-mentioned group. There were two Carloaders and one Yardlift—20 in use. The operators were chosen from among many applicants, on the ground of psychotechnical tests.

The new warehouse has an area of 3000 square meters and was planned for handling and storing palletized material.

You, too, can achieve important economies by means of a properly planned installation of Clark materials-handling machines—plus Clark's thorough training preparation to assure maximum benefits. A Clark distributor is near you—with a trained staff qualified to draft unbiased recommendations. To arrange for that counsel, write to the Export Division.

CLARK EQUIPMENT COMPANY • EXPORT DIVISION

BATTLE CREEK 73, MICHIGAN, U.S.A.

Other Plants—Buchanan—Jackson, Mich. Distributors in Principal Cities Throughout the World

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Many thousands of miles of good roads have been built at low cost with Esso asphalt. After many years of hard use, these same roads continue to render excellent service. If you have road construction or maintenance problems, Esso engineers are pleased to place their knowledge and long experience at your service. Consult the nearest Esso office.

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(67,500,500 HP thru Jan. 1950.)

Industrial Diesel Generator units of 350 to 1000 KW output are operating in, or ordered for, the following countries:

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GM DIESEL GENERATOR UNITS ARE:

Easy and inexpensive to install, shipped fully assembled from factory;
Easy to operate, due to automatic devices controlling lubrication, cooling and load;
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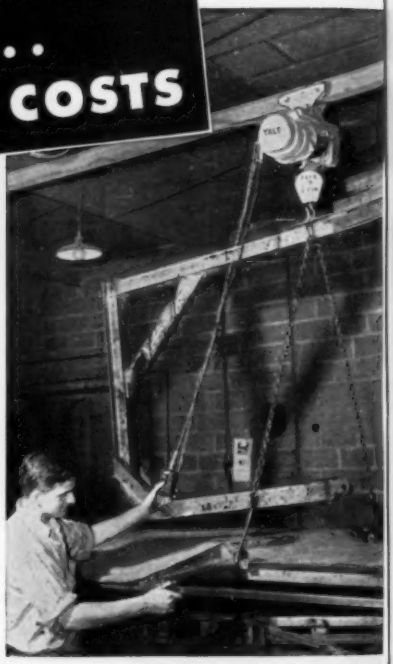

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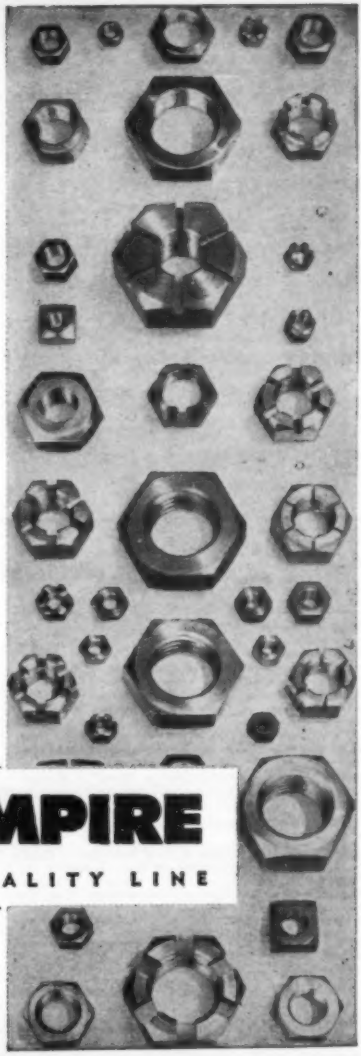

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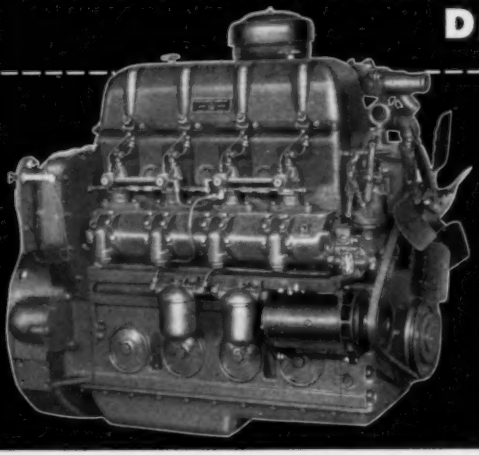

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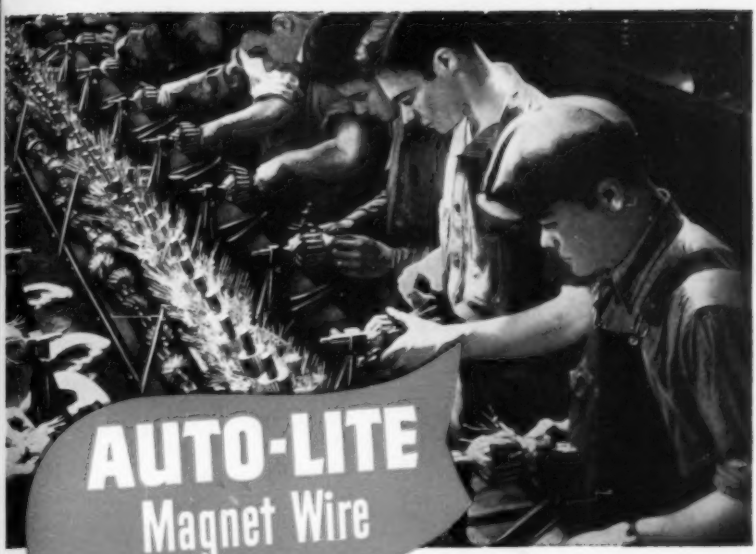

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